Public Document No. 25

FIFTY-FIRST ANNUAL REPORT

OF THE

COMMISSIONERS

ON

FISHERIES AND GAME

FOR THE YEAR 1916.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1917.

Winter feeding station for birds on estate of Mr. F. H. Kennard, at Newton.

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Publication of this Document
approved by the
Supervisor of Administration.

COMMISSIONERS ON FISHERIES AND GAME.

WILLIAM C. ADAMS, Newtonville (*Chairman*).
GEORGE H. GRAHAM, Springfield.
ARTHUR L. MILLETT, Gloucester.
GEORGE W. FIELD,[1] Sharon (*Chairman*).

Chief Deputy Commissioner.

ORRIN C. BOURNE.

Clerk.

W. RAYMOND COLLINS.

Biologist.

DAVID L. BELDING.

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[1] Service expired Feb. 18, 1916.

CONTENTS.

The Commonwealth of Massachusetts.

To His Excellency the Governor and the Honorable Council.

The Commissioners on Fisheries and Game respectfully submit their fifty-first annual report.

Appointments.

During the past year the following changes have been made in the personnel of the Commission: —

Mr. Arthur L. Millett of Gloucester was appointed as Commissioner by His Excellency the Governor on February 9, confirmed by the Council on February 16, and duly qualified on Feb. 18, 1916, Dr. George W. Field of Sharon retiring after more than ten years of continuous service as chairman. To this work Mr. Millett brings a long training and intimate experience with the salt-water fisheries, which should place the new Board in closest touch with the commercial fisheries.

On February 29 Commissioner William C. Adams of Newtonville was elected chairman of the Board of Commissioners.

Commissioner George H. Graham of Springfield was reappointed as Commissioner for a second term of five years on Aug. 3, 1916.

Reorganization.

Effective business organization must underly the activities of any department, so when we started the reorganization of our department in February (two and a half months after the fiscal year had begun), we aimed to institute desirable changes as rapidly as circumstances would allow. All the details had to be studied out by the commissioners, assisted by an already overtaxed office force which could proceed with the plans only as the routine work would permit.

A proper handling of the finances is the first essential, and for this reason it is advisable to state how the money to conduct the department is provided. Each department must file on

or before November 15 a budget containing its estimates for operating expenses and new construction work for the next fiscal year. It is on the basis of this budget that the annual appropriations are made. These appropriations are divided into two classes, the first covering the maintenance and operation, the second, new construction work.

The fiscal year begins December 1 and ends November 30. The annual appropriation for both classes, having to be determined by the Legislature, may not be known until well along into the fiscal year. For instance, the maintenance appropriation this year became available March 1, 1916, that for new construction work, June 1, 1916, and a small additional appropriation for each class, June 2, 1916. The foregoing is not stated as a criticism of legislative action, but simply to show the absolute inability to start the year's work on a fully arranged financial schedule. Pending the determination of the annual appropriation we are authorized to expend in maintenance not more for each division than was expended during the preceding year. No new construction work can be started until an appropriation covering it has been made.

For the balance of the year we made such changes in the business as would best carry the work through the year, and devoted our attention to a new system to be put into operation at the beginning of the next fiscal year, that is to say, Dec. 1, 1916.

Central Office.

The next step was to make the central office the clearing house for all the work of the department. In order to do this such a system of accounting and reports was required as would keep the central office closely in touch at all times with the various activities.

The central offices have been moved to new quarters on the third floor of the new east wing. In the transfer a new private office for the commissioners was made possible, together with a more businesslike reception room. A new style of counter was installed in this room, provided with a large number of compartments to hold blank applications for the stock distributed, copies of reports and pamphlets for distribution. The office force is now housed separately in a large room, thus avoiding

many interruptions in its work. When the transfer was made much time was devoted to going over old records, destroying those which were no longer of value. A large number of books and pamphlets were sent to the State Library, with the result that much valuable floor space was saved for other purposes. This has been further increased by replacing old filing cabinets with those of modern style, and in distributing to public museums a large number of specimens. The demands have been studied to see where labor-saving devices could be installed, in order to increase effectiveness. A "call" system from the Commissioners' office to the office of the force, an outside messenger call service and two additional telephones have also helped speed up the work.

The principal activities are grouped into divisions. The aim has been to place each division under a single head who shall be responsible for its effectiveness.

Law Enforcement.

The deputy force was put under a chief deputy by a vote of the Board, thus establishing the office of chief deputy. Heretofore the force had been controlled by such an officer, who had never had such direct authorization, and consequently had been less vigorous in his control than is now the fact.

Fish and Game Propagation.

In the division of fish and game propagation one man has been put in charge of all fish and game distribution. The superintendent of each fish hatchery and bird farm has been authorized to hire and discharge his men, he alone being held responsible for the results produced.

Fish Salvage Work.

This includes seining ponds and distributing the catch in other ponds, patrolling breeding streams of smelt, collecting fish eggs, fry and adult stock for brood fish and restoration of fishways.

When field work was started in salvage work a man was designated to have charge of it, and he alone was held answerable for its effectiveness.

Publicity.

The division of publicity was put in charge of Dr. Belding, the biologist. The duties of this division are to see that articles covering the work of the department are periodically sent to the various newspapers in the Commonwealth as well as to magazines and other publications which have to do with these subjects. Special monographs will be prepared from time to time containing reports on research work in scientific fields. Special publications will be made on the development of certain assets in the State, such as the restoration of fishways, the development of the small ponds in the hands of private owners as commercial fisheries, the screening of outlets to all the principal ponds, the feeding of birds in the winter, and general constructive ideas. Publications will also be issued designed to develop the interest of the young people of the Commonwealth, notably the Boy Scouts and Camp Fire Girls, along those lines which will aid them to render a real service to the State.

Publications.

Much had to be done to bring the work of the department up to date. Within the past ten months we have published a combined report for the years 1912, 1913 and 1914, and a separate report for the year 1915. This latter report contains an exhaustive study of the natural history and culture of the soft clam (*Mya arenaria*), which further completes perhaps the most extensive series of reports upon the commercial mollusks ever made in this country.

Organization.

With the beginning of the new fiscal year the following changes were put into effect: —

Law Enforcement. — From the sum appropriated for law enforcement were deducted the salaries of the deputies, which are fixed, together with certain known expenditures which would have to be met during the year; also a reserve fund to meet contingencies. The balance was then divided among the deputies for operating expenses. The deputies were divided

into two classes, Class A and Class B, based on the comparative cost of patrolling their districts, those covering districts where trolley lines and railroads were few being given larger operating expenses. The deputies in each class were given a fixed allowance for operating expenses which they were not permitted to exceed unless having first obtained authorization from the central office so to do. Applications for extra allowance must be made on a blank form furnished, and must state the amount desired and reasons for the request. When an emergency arises the deputy may meet it if it involves extra expense, but he must immediately thereafter report the facts and the extra amount expended. These overdrafts are met out of the reserve fund. If during a given month a deputy does not use up all of his allowance, the balance is credited to the reserve fund. This system gives us complete control over the appropriation at all times, — something we have never had before.

Hatcheries and Game Farms. — Prior to the filing of the annual budget, each superintendent of the fish hatcheries and bird farms was required to submit an estimate of the cost of operating his station for the coming year, based on an itemized schedule form covering each month, supplied from the central office.

At the beginning of the year, from the sum available for this division (being the amount expended during the preceding year), were deducted certain sums which the Commissioners considered advisable to set aside for specific purposes; also a reserve fund to meet contingencies. The balance was then divided among the several stations in proportion as their estimates bore to the total sum available. The superintendents have not as yet been required to conform exactly to the items estimated on in each month's schedule, so long as they do not exceed the sum total allowed for each month. But in no instance are they permitted to exceed the monthly allowance without having first obtained written authorization from the central office so to do. A blank form of application for extra allowance is furnished, which requires that the exact amount and detailed reasons be given for the request. Such extra allowances are met out of the reserve fund. Any unexpended

balances at the end of the month are credited to the reserve fund. Here again we have complete control over the appropriation at all times, — something we have never had before.

Accounting Records and Reports.

In order to properly account for the various subdivisions of the appropriation for maintenance, a new set of books was designed and printed for the bookkeeping department laid out on the following plan: —

Law Enforcement. — Each deputy is given a full page in the law enforcement book divided up into a series of columns, each one of which has a heading similar to an item appearing on the blank form which he uses in reporting his operating expenses for the month. At the top of the page appears his name and a statement of the class to which he belongs, and the amount allotted to him for monthly operating expenses. Upon receiving his expense account for the month (which is divided into many divisions, such as railroad fares, hotel bills, meals, team and boat hire, telephone, etc.), if the account is found correct it is also entered in the above book, each month's statement following the preceding. In this way it is possible to tell at a glance exactly how much money each deputy expended in each branch of his operating expenses during a given month, and how much he has expended from the beginning of the fiscal year to date for such purpose. A column is also provided to show the amount of extra allowances authorized (as is provided for in the reserve fund above referred to under law enforcement); likewise a column to show the return of any unexpended balance.

Bird Farms and Fish Hatcheries. — A special book has been made up for each hatchery, divided into columns to correspond with the items in the schedule form submitted to each superintendent on which to make up his annual budget referred to above. Each month he is required to file a schedule containing his operating expenses, together with vouchers for all other expenditures made at his station. On the back of each voucher is stamped a blank form of return in which he must indicate what division of his budget the particular bill is to be charged

to. In this way it is possible to tell at a glance exactly how much money each superintendent has expended each month in each division of his schedule. These accounts are kept from month to month in chronological order, so that it is possible to tell at any time how much money has been expended by each superintendent from the beginning of the fiscal year to date in each division of his estimate.

Order books have been printed for each station, three orders to a page. They are arranged in triplicate; the first copy goes to the person or concern from which goods are to be bought, the second is forwarded to the central office, and the third remains permanently bound in the book. Nothing may be ordered at any station unless based on an order from this book. When bills are sent to the central office from the station they are checked up with the orders on file in the central office.

A stock sheet has been designed upon which a weekly report must be given by each superintendent of the stock on hand, including eggs collected, eggs set, stock reared and stock distributed. The balances are brought forward from week to week, thus making it a continuous history of what takes place in respect to any given lot of stock from the beginning to the end of the fiscal year. A time sheet has been worked out for each employee at each station, including the superintendent, so subdivided over the various activities of the station as to make it a simple matter for each employee to each day mark up the time devoted by him to any particular work. Provision is made for any new construction work undertaken at the station, so that hereafter it will be possible to discover how much labor has been supplied from the employees of the stations in such new construction work, in order that the same may be figured in on the ultimate cost.

A sales book has been designed for each station in which must be recorded all sales of produce such as eggs, poultry, etc., made at each station, and once a month a return accompanied by cash must be made to the central office on a form supplied for that purpose.

A property book has also been worked out which from now on will enable us to keep accurate record of all new additions

to the several stations and their accurate cost. This will also serve as a continuous inventory, enabling us at all times to check up the value of the stock and equipment at a given station.

Fish and Game Distribution.

We have in mind a complete revision of the various forms of applications used for fish and game distribution, together with a complete reorganization of the methods of handling the distribution of stock from the stations.

With all the above will go thorough changes looking toward a cleaner-cut business administration of the entire department, to the end that we may have the best administered Fish and Game Commission of any State in the country.

GENERAL CONSIDERATIONS.

It is a well-settled proposition of law that the ownership of all wild fish, birds and quadrupeds other than migratory birds is vested in the State, and that with the General Court rests the duty of regulating their preservation against wasteful destruction. For example, it may determine the time within which the same may be taken, the manner of taking, and when reduced to possession, the character of the property rights to be exercised. Birds and game may not be sold, and in certain cases may not be shipped outside the State.

The Commissioners are the agency to put into operation the enactments of the General Court, and do not "make the laws" as so many people suppose, though they are at all times charged with the care of this great property. Their principal duties may be divided into the following groups: —

(1) The adequate and proper enforcement of laws relative to the protection of fish and game.

(2) The propagation and distribution of fresh-water fish at four hatcheries and one rearing station.

(3) The propagation and distribution of game birds at five game farms.

(4) The oversight and regulation of important commercial salt-water fisheries, both shore and deep-sea, together with the problems of increasing the supply.

(5) The pursuit of scientific investigations relative to birds, fish and game.

(6) The education of the public in the proper use of these resources and in the problems of artificial stocking.

Courtesies and Acknowledgments.

The Commission is indebted to —

The railroads of the State for courtesies in the transportation of fish, birds and eggs, and the return of the empty cans to the hatcheries. Also for taking charge of and posting all posters of the fish and game laws and other printed matter in the stations on their lines.

The United States Commission on Fisheries for privileges

and favors at the Woods Hole Station, as well as assistance in the distribution of fish and fish eggs.

The California Fish and Game Commissioners for their ready co-operation in an effort to locate an annual supply of shad eggs.

The Oregon Fish and Game Commission for assistance in obtaining an annual supply of Chinook salmon eggs.

The various State fish and game associations for their whole-hearted co-operation in the protection and propagation of fish and game.

The newspapers of the Commonwealth for their fairness and accuracy in reporting the work of this Commission.

The Evans Memorial Hospital for providing excellent laboratory facilities for scientific investigations through the courtesy of the director, Dr. Frank C. Richardson.

The Eastern Advertising Company for the use of their bill boards in displaying posters.

The public at large for their efforts in feeding the birds in the winter.

The Great Problem.

It is useless to call any methods or policy effective in the preservation of the wild life of this Commonwealth, which stops short of preserving the present breeding stock intact, and of adding to that breeding stock a substantial portion of the natural annual increase. The growing number of hunters and fishermen, together with a larger amount of vermin (particularly hunting house cats), and the yet unsolved "winter kill" and "cold, wet spring and summer" problems, are making heavier demands on that portion of the natural increase available. Hence, the stock must have all possible protection, assisted by artificial propagation on a larger scale, with such readjustment of the laws from time to time as will balance the equities between the takers and the taken.

Annual Reports.

All subsequent reports of the Commission will cover the fiscal year December 1 to November 30, inclusive, instead of the calendar year, as previously. This change is made for the sake of uniformity in both financial and general reports.

National Activities.

The Massachusetts Commissioners have always held offices of great importance in the national associations which have to do with the larger phases of the work. We believe we should continue to be closely identified with all interstate and national problems, contributing our share toward their solution.

Commissioner George H. Graham represented the Board at the meeting of the American Fisheries Society and the National Association of Game and Fish Commissioners in New Orleans last October. The full Board attended the meeting of the Game Breeders' Association in New York City in December.

Our Natural Resources.

Why should sportsmen be forced to take expensive trips to Maine and the Provinces for fishing and hunting, when there are latent facilities in Massachusetts capable of offering as good fishing, and in some respects as good hunting? Mr. Sportsman, are you thoroughly acquainted with the natural fish and game resources of your native State? Necessarily Massachusetts can never offer any big game hunting except deer, but for small game and birds of all varieties her facilities are hardly equaled by any State in the Union. The same can be said of her streams and ponds. With this Commission lies the possibilities of opening up these natural resources to afford recreation and sport for both vacationist and working man.

What has Massachusetts to offer? Over 800 natural ponds and lakes, all over 20 acres in area; a host of artificial ponds of all sizes, scattered from Barnstable to Berkshire, and some 4,000 miles of streams, all of which are potential producers of many species of fresh-water fish; a long shore line indented with bays and coastal streams, where all forms of recreative and commercial shore fishing are available, not to mention excellent shore bird and waterfowl shooting; over 62,000 acres of wild land reservations for the protection and propagation of game birds; and a varied and abundant supply of forest, brush and swamp land suitable for such game as white hares, deer and birds. Such are the latent natural resources of our Commonwealth which await development.

Field and Stream.

Outdoor sport is a great factor in the making of good clean citizens. Any man with the love of nature and the great outdoors in his heart cannot be otherwise than a valuable member of his community. The physical effort and the training of muscles, eyes and senses in outdoor recreation have saved many a busy business man from a nervous breakdown. In the "strenuous" life of to-day it is essential that facilities for rest and pleasure be afforded close at home. A great opportunity for recreation on field and stream lies at our very doors, and needs but the touch of the magic wand for awakening. The sports of hunting and fishing closely woven into our national growth have in no State been a more powerful factor than in our Commonwealth.

Commercial Fisheries.

Inland fishermen should not forget that on the coast of Massachusetts are commercial salt-water fisheries of great value. From these fisheries Massachusetts derived her origin and early wealth, and to-day Boston and Gloucester rank among the leading fishing centers of the world. Verily, the historic codfish of our Commonwealth well deserves its fame.

The Fish and Game Commission does not exist, as is often considered, solely for the interests of the angler and hunter; it also has the important duty of conserving and regulating the commercial fisheries which employ a large number of men, and are a source of food supply to a vast population. Its efforts are directed toward the oversight of the shore fisheries, preservation of the lobster and shellfisheries, experimental investigations to increase the production and the education of the fishermen in regard to the general status of the fisheries. The establishment of a fisheries institute, the opening of new experimental fields, the regulation of injurious methods of fishing, and the advisability of establishing a salt-water fish hatchery, are future problems to be undertaken. This Commission has always been a pioneer in fishery work, and aims to enlarge its influence in the salt-water fisheries.

Alewife Fisheries.

It is the purpose of your Commissioners to take up various phases in the conservation of our natural resources, and to present these problems individually in succeeding annual reports after due investigation. The alewife fishery of the Commonwealth is a neglected though important asset, possessing in itself not only an intrinsic value as a commercial fishery, but also affecting the salt-water fisheries as a whole, by reason that the alewife is one of the great sources of food for the more valuable fishes which come to our coastal waters. We are pleased to announce the completion of a preliminary survey of all the alewife streams within the borders of the Commonwealth, and we are now in a position to give definite directions for the reclamation, where possible, of each fishery. The alewife situation should receive careful thought, for it opens up a large field for developmental effort.

Future Development.

The Commissioners have general plans for future work along the lines indicated below.

Inland Fisheries. — (1) Completion of the survey, now well started, of every public pond, lake and stream in the State, and the determination of a policy for stocking each.

(2) Increased hatchery production.

(3) Keeping inland streams free of injurious polluting substances.

(4) Development of the recreative facilities of our inland lakes and ponds to attract vacationists and keep sportsmen within the Commonwealth.

(5) Encouragement of private fish raising as a legitimate and profitable industry.

(6) Introduction of new species of fish into Massachusetts waters wherever environmental conditions are satisfactory, *e.g.*, the Chinook salmon, bluegill sunfish, catfish and whitefish.

Commercial Fisheries. — (1) Development of the shellfisheries by a system of sea farming.

(2) Re-establishment of the depleted alewife fisheries.

(3) Preservation of the shore and deep-sea fisheries by elimination of destructive methods of fishing.

(4) Establishment of a fishermen's institute for the development and training of fishermen.

(5) Protection of the lobster fishery by formation of lobstermen's associations and by propagation.

(6) Investigation of the advisability of erecting one or more salt-water fish hatcheries.

(7) Study of the problem of marketing fresh fish and shellfish over longer distances in a wholesome condition and at a decreased cost.

Game. — (1) Increase in the number of game refuges and reservations, more in the direction of permanent preserves, owned by the State, where shooting will be prohibited for all time, and the making of these ranges into ideal summer and winter homes for birds by the elimination of vermin and the planting of food-bearing trees and shrubs.

(2) Encouragement of private game propagation.

(3) Securing the largest output from the State game farms at the lowest cost of production.

(4) Introduction of suitable new species of game birds and quadrupeds.

(5) Feeding of the birds in winter.

(6) Elimination of noxious vermin.

(7) Study of effects of poisonous sprays upon birds and quadrupeds.

(8) Continuation of investigations with a view to ascertaining suitable plants, aquatic plants, shrubs and trees which will supply food for wild birds and waterfowl.

(9) Considering a change in our method of tagging birds and game in order to make the same less expensive and cumbersome for the handlers.

Scientific Investigations. — (1) More extensive studies into the problems confronting the commercial fisheries, such as shellfish farming, otter trawling and restoring the alewife fisheries.

(2) Experiments in introducing new species of fish, a study of fish diseases and biological observations of inland waters.

(3) New methods of rearing game birds, and means of combating their diseases.

Education. — (1) Training of school children, especially the Boy Scouts, to appreciate the necessity of preserving our wild life.

(2) Encouragement of the formation of more fish and game associations in the State, to serve as clearing houses for ideas, and to guide local activities in all matters which make for the improvement of conditions.

(3) Impressing upon the public the value of eating more fish and shellfish as bearing on the high cost of living.

(4) Bringing about a proper understanding by sportsmen of the rights of landowners and the elimination of damage to property and unbecoming conduct in the field.

Legislative Recommendations. — The Board of Commissioners on Fisheries and Game respectfully recommend the passage of laws designed to accomplish the following purposes: —

(1) To provide for the punishment of persons assaulting or interfering with officers enforcing the fish and game laws.

(2) To provide for the control by the Commissioners of certain Great Ponds for the purpose of cultivating useful fish, birds and quadrupeds.

(3) To amend chapter 118, Acts of 1911, relative to the penalty for violation of the provisions of said chapter.

(4) Providing a penalty for the violation of chapter 542, Acts of 1913.

(5) Amending section 133 of chapter 91 of the Revised Laws relative to the discharge of waste materials into public waters.

(6) Amending chapter 270, Acts of 1913, relative to gray squirrels.

(7) Amending section 8, chapter 92, Revised Laws, as amended by Acts of 1903, chapter 330, relative to the use of the bodies or feathers of certain birds for millinery purposes.

(8) Amending section 67, chapter 91, Revised Laws, as amended by chapter 329, Acts of 1904, relative to pickerel.

(9) To amend chapter 118, Acts of 1907, relative to loons and grebes.

(10) Amending chapter 465, Acts of 1912, relative to the appointment of town wardens.

(11) Authorizing the Commissioners on Fisheries and Game to take or receive as a gift, or lease or purchase in the name of

the Commonwealth, such improved or unimproved property as they may deem necessary, and to control and use such property.

(12) Relative to hunting of game on State reservations, parks, commons or land held in trust for public use, or upon public highways.

(13) Amending chapter 472, Acts of 1910, extending protection to the Bartramian sandpiper, upland plover, heath hen, wood duck, wild or passenger pigeon, Carolina or mourning dove, gulls or terns.

The Sportsman.

As indicating the close touch which the Commissioners are keeping with the sportsmen of this State, we cite a heart-to-heart talk with them in the following poster, which was displayed all over the State at the opening of the hunting season last fall: —

The Commonwealth of Massachusetts

COMMISSIONERS ON FISHERIES AND GAME.

William C. Adams,
George H. Graham,
Arthur L. Millett,
Commissioners.

Season of 1916 and 1917.

To the Sportsmen:

The season is at hand during which the shooting of most of the game birds and animals of the State is lawful. Before you start on your fall hunting trips, we wish you to consider the following propositions:

THE LANDOWNER AND THE SPORTSMAN.

Title to the wild life is vested in the State or the Nation (depending on the species), but whether or not you will be permitted to hunt on most of the land in the State rests with the landowners. Your hunter's license does not give you the right to go on any man's land against his wish. It is, therefore, squarely up to you to decide whether your actions will encourage the landowners to refrain from posting, or whether, by reason of acts of vandalism and thoughtlessness (to say nothing of negligence on your part), the landowners in self-protection will be compelled to keep you off.

If your record is good, what will you do this year to force guilty persons to understand that they are threatening the existence of your sport? We believe the landowners will meet you more than half way, and will not go to the expense of posting, and suffer the loss of time patrolling, unless you drive them to it.

It is up to the 75,000 hunters in the State to act as field agents for the landowners, to assist in prosecuting any violations of property rights, and to see to it that the country is left in better condition than they found it.

WILD LIFE — FUTURE OF THE SPORT.

It is elementary that the destruction of more wild life each year than comes into existence means rapid and complete extermination. Your slogan should be, — **put back two for every one taken.** To do this — kill vermin, feed the birds in the winter, observe reasonable bag limits, and assist in artificial propagation. If you are in doubt as to what to do, write to us.

Every sportsman should be equally interested in preserving the insectivorous birds. They are of untold value to the land. This is one positive way to help the man over whose land you hunt each year.

GAME LAWS AND DEPUTIES.

The game laws were enacted for your benefit, and restrict the taking of wild life to make possible your slogan of putting back two for every one taken out (and this applied equally to birds, quadrupeds and fish). Their violation means a greater loss to you than to others because this is **your** sport.

The deputy is working for **your** interest. His district covers about 415 square miles. If he covers a square mile to-day, it may take him over a year to get around to it again. He is your servant, but will appreciate your help. His interests should be your interests. He has dedicated his life to assist in establishing the improved conditions of sport which you desire. A good many hunters think that violating the fish and game laws and getting away with it is part of the game. The more you think this over, we believe the less willing you will be to subscribe to this doctrine.

FIELD DEPORTMENT.

Don't shoot until you clearly see your game, and not even then unless you have your partner located. Stop if some building is in line with your shot. The only **safe** gun is the one apart in your case. You can't be too careful with it at any other time. Give your partner a few of the shots. Don't try for a "hundred per cent."; the man never lived who could do it day in and day out. Give your dog a square deal, and if you have neglected him for eleven months, don't expect him to be a finished hunter and going strong at the end of the first day.

FOREST FIRES.

Every square mile burned over means a great loss to the landowner who from now on you are going to protect. It means less shooting ground for you and less breeding ground for game. Report a fire to the nearest town forest warden. Help fight it. Break your match in two before you throw it away.

THINK THIS OVER.

When you gather in camp on the "night before," or compare notes at the end of the day, let the above propositions sink in. Our desire is to make the good old Commonwealth more and more attractive to live in every year, and among other things to increase and perpetuate your sport. We shall always be glad to hear from you on the problems involved, and we wish you good luck and wholesome recreation when you go hunting.

Commissioners on Fisheries and Game.

EDUCATIONAL FEATURES.

Publicity is a most essential factor in the preservation of our natural resources. Until the public fully appreciates the value and necessity of this type of work no great advance can be made, since the enactment and proper enforcement of laws for the protection and propagation of fish and game depend upon the mighty power of public sentiment. The Commission is furthering this educational propaganda by lectures, publications, exhibitions, and by instructing Young America in the wholesome pleasures of the Big Outdoors. We hope to accomplish good work in the schools by furnishing exhibits for instruction in nature study. Our game farms and fish hatcheries are always open to visitors, and in the proper seasons the methods of fish and game propagation are demonstrated. We should be pleased at any time to give full instructions as to how to reach them by train or automobile, and to inform prospective visitors of the more favorable time of the year to call. Our superintendents are glad to show visitors about and answer questions with regard to the different problems involved in the work.

Boys and Girls.

In order to stimulate public sentiment for the better protection of wild life the boys and girls should be thoroughly trained in all matters pertaining to the conservation of fish and game. We believe that education is always better than force, and our deputies are instructed to arouse the interest of the children in the cause rather than resort to legal measures if they can possibly be avoided. Some of our most gratifying results have resulted from showing the thoughtless boy the error of his way, thus making him our friend instead of alienating him forever by a court record.

The problem is to bring the child into close personal contact with the scheme by walks, outdoor classes and the opportunity to observe living specimens under conditions which are designed to catch and hold his interest.

Boy Scouts.

It is planned to devote special attention to the Boy Scouts. Plans are now under way for interesting the members of this organization in the work of the Fish and Game Commission, and in the preservation of wild life. By teaching the boys to serve collectively and individually in the protection of our fish and game, a great and important step will be accomplished. It will also provide entertaining instruction for all.

The instincts of the typical active boy should not be so much restrained as directed by education toward the protection of fish and game. By training him as a guardian and not a destroyer of nature, in a few years he will become a clean, wholesome sportsman. Protection of game and fish cannot be conducted more effectively than by placing an army of interested boys to guard our woods. The rearing of clean-cut, red-blooded, nature-loving youths will prove a bulwark of preparedness for the nation.

It was our pleasure to attend the review of the Scouts in the Harvard Stadium on July 24, where a sight met the eyes of the audience which will live in the memory of all. Hundreds of Scouts, full rigged for duty, marched under their legends, while Old Glory was borne aloft by many a sturdy band.

When the sun broke through the clouds and flooded the little army with almost a halo of light as it marched by, no man worthy of the name in that vast crowd could resist the impulse to stand with uncovered head. Every mother's heart must have throbbed with pride to realize that *her son* was in that line.

The Boy Scouts of America won the hearts of the Fish and Game Commissioners, and here, as often in the past, we send to them our greetings. We want them to come into close relationship with us in order that as young boys and old boys we may work shoulder to shoulder, "to make the good old Commonwealth more and more attractive to live in each year."

Exhibitions.

The popularity of the educational exhibitions of fish and game at various agricultural fairs in the Commonwealth is well evidenced by the increasing number of requests which are regularly received. This year no fewer than twenty-eight were made at Lawrence, Cambridge, Gloucester, Marshfield, Barnstable, Athol, Worcester, Grafton, Maynard, Taunton, Wakefield, Topsfield, North Easton, Barre, Willimansett, Abington, Greenfield, Amesbury, Westport, Great Barrington, Palmer, Northampton, Ware, Segreganset, Wareham, Fitchburg, Attleboro and Holyoke. By reason of late arrival and limited funds several requests had to be refused.

The efforts we have made at the various fairs in the past have stimulated great interest in our work, with the result that many of the local associations are now providing permanent exhibition cages, and furnishing aquaria, water, etc. In all instances the Commission loans its material, and provides a trained man to take charge of the exhibit and to answer all inquiries as to the work.

The first 1916 exhibition was at the annual Gloucester Day celebration in Stage Fort Park, where our display was given a very prominent location. Ten aquaria containing trout, salmon and pond fish such as the Commission is rearing and distributing, and ten cages of birds from the State game farms, were exhibited. Such displays are of particular interest to many persons who never before realized what the State has accomplished in public fish and game propagation and distribution.

On June 17 and 24 an educational exhibit of fish and game was given at the Boy Scout field day at the Harvard Stadium, Cambridge. Ten cages of live game birds from the State game farms and ten aquaria with various species of fresh-water fish from the State hatcheries were displayed to an appreciative audience. Those exhibited principally included the brook and rainbow trout, Chinook and landlocked salmon, small and large mouthed black bass, bullhead, yellow and white perch, pickerel and sunfish, together with the specimens of all of the game birds reared in several stages of their growth. It is our intention to add to these exhibits preserved specimens of our

Exhibition of live fish and game from the State hatcheries and game farms. Such displays have proved a most popular feature at numerous agricultural fairs.

Educational exhibit, illustrating methods of protecting and propagating fish and game.

salt-water fish and shellfish, as well as natural history studies. One object of the work is to arouse interest in the breeding of birds for the profit and pleasure to be derived, and to encourage the utilization of the vast number of small ponds and waste land in the State for the raising of fish and game for market.

Natural History Specimens.

About eighty finely mounted specimens of birds, quadrupeds and fish which had been collected during the past ten years by the Commission to form a nucleus for a State Museum have been distributed among the following natural history museums of the State: —

Museum of Comparative Zoölogy, Cambridge.
Cape Ann Scientific and Library Society, Gloucester.
Peabody Museum, Salem.
Natural History Museum, Pittsfield.
Natural History Museum, Worcester.
Museum of Natural History, Boston.
Bristol County Academy of Sciences, Taunton.
Boy Scout Headquarters, Boston.

Lectures.

The Commission has an extensive collection of lantern slides picturing various phases of fish and game life, and describing the work of the Board, together with suitable equipment for stereopticon demonstrations. Frequent lectures are given by the Commissioners, the biologist and various deputies before clubs and associations. This new branch of work gives promise of most valuable results. Many citizens are desirous of becoming better informed on fish and game propagation, and these practical lectures answer this purpose, as well as furnish a means of stimulating interest in game protection.

Publications.

An important method of education in fish and game preservation is through the medium of printed instructions in the form of reports, special bulletins and papers. We plan greater efforts in this line, as this Commission is unable at the present time to supply the demand for such works. Our publications

are limited by law to an annual report, special reports when authorized by the Legislature, and the publication of small pamphlets on game laws and bird rearing. During the past year we have published: —

(1) Triennial report for 1912, 1913 and 1914.

(2) Annual Report for 1915, including a special report upon the clam fishery.

(3) Special pamphlets upon rearing quail and mallard ducks.

(4) Digest of new game laws.

(5) Report upon an investigation of the fisheries of Buzzards Bay.

(6) A special poster to hunters. During the ensuing year this will be followed by other posters, such as (*a*) to the fishermen, (*b*) on the control of the feral house cat, (*c*) on winter feeding of birds and constructing bird shelters.

(7) Circular letters relative to fish and game conditions.

While much has been accomplished as far as laws permit, more must be done before this Commission can attain its full and normal sphere of usefulness to the citizens of the Commonwealth. There is a distinct need for a quarterly bulletin containing popular articles on natural history, educational facts relative to fish and game life, and the progress Massachusetts is making in fish and game propagation and protection. It is through this type of educational publications that the true facts concerning the custodianship of our wild life can be brought to the attention of the people. The publication of such a bulletin will require a special legislative act, which will be asked for at the next session of the General Court. It should meet with the hearty approval of all persons interested in our natural resources.

In addition, special bulletins on various subjects should be published from time to time and distributed where they will accomplish most good. Educational pamphlets upon live topics relative to fish and game work, for the benefit of the Boy Scouts, are in process of preparation.

The distribution of the copies of the fish and game laws in convenient pocket size has always met with grateful response on the part of the public, and has provided a valuable aid in the enforcement of the laws. A larger number of copies and wider distribution is urged.

Group of natural history specimens which were distributed among the museums of the State in 1916 by the Fish and Game Commission.

Associations.

Within this Commonwealth are numerous associations having many and varied aims, yet all are bound together by the common tie of love for the great outdoors and the earnest desire to assist in the preservation of our wild life. It is ever the desire of your Commissioners to bring these associations closer together for the mutual good to be accomplished through co-operation. Sportsmen's associations, bird clubs, natural history societies, the State Grange, museums, agricultural institutions, — all have a vital interest in the work of increasing the supply of fish and game. The Commission is in a position to serve admirably as a central clearing house and bureau of information for the various organizations. Every institution should learn something about the work and aims of the others. Here is a chance through the medium of this department.

Sportsmen's Associations.

Few persons not closely associated with the work realize that within the bounds of the Commonwealth are 136 sportsmen's clubs with a membership of from 10 to more than 1,500 each, not including the Audubon and other societies interested in our song and insectivorous birds. If such praiseworthy increase continues, and the inevitable bonds of good fellowship which naturally develop in a common cause become well established, we may indeed look to the future with optimism.

The work of such associations is invaluable to the proper and consistent administration of its duties by the Fish and Game Commission. Their assistance is confined not merely to distribution of stock; it also is the means of molding and guiding local sentiment into proper channels. Through them the demands of the different sections of the State are brought more specifically to the attention of the Commission. Success to the increasing membership of our sportsmen's societies! It means more game and sport for all.

The one feature in connection with rod and gun clubs which is open to criticism is overzealousness in the work of distribution. They often ask and expect too much in the allotment

of fish and game. The Commissioners deeply regret that they are not always in a position to supply all demands. The amount of fish available for distribution is limited for financial reasons, and each portion of the State is allotted its share before shipments begin.

FISH CULTURE.

The Fish Crop as an Asset to the Commonwealth.

Fish, in addition to the recreative advantages which they afford, have a market value which is often little considered. The fisherman who brings home a mess of fish is not only furnishing himself with a good day's sport, but also is lessening his butcher's bill by supplying a substitute for meat. Particularly is this true of the white, yellow and pike perch as well as other food fishes with which the Commissioners are stocking the lakes of the Commonwealth. From a recreative standpoint the value of the fish and game crop far outweighs its market value. The development of our beautiful fresh-water lakes for summer campers attracts many business men from the cities, increases the taxable property in rural communities, and furnishes direct and indirect financial benefit to the local inhabitants.

Our Inland Waters.

Too few persons take advantage of the splendid opportunities for sport and recreation which are at hand. Your Commissioners are hard at work on the problem of stocking the inland waters with suitable fish for the benefit of the public, and though considerable progress has already been made, far greater advances should soon follow. Surveys to determine the suitability of these ponds and streams are now being completed, and the productive capacity of the State hatcheries is being increased as rapidly as appropriations will permit.

The past few years have witnessed radical changes in our fresh-water fisheries. The advent of the automobile and motorcycle has caused a great increase in the number of fishermen, and correspondingly a great drain upon the natural resources of our ponds and streams. Not only the inland waters easily accessible by road and rail, but also those in the more remote and outlying districts are excessively fished. There is but one means of solution. To offset the foregoing conditions greater efforts must be forthcoming in artificial propagation.

Hatcheries.

Do you know how eggs are obtained from fish? How they are fertilized? How the young are reared? If you do, you must take credit for having a more intimate knowledge of this work than the great majority of our citizens. Ignorance of the work now being accomplished by the Fish and Game Commission is to be deplored, particularly since almost every one has ample opportunity to acquaint himself in detail with all of the various phases. The Commission operates fish hatcheries at Sutton, southeast of Worcester, at Sandwich on Cape Cod, at Palmer near Springfield, and at Adams in the Berkshires.

What is more pleasant than an automobile trip or excursion to one of the above stations, all of which are located in the rural districts, within reaching distance of large cities? The various methods of propagation are always open to inspection. Visitors are most welcome.

The following is a list of the State hatcheries: —

Adams Hatchery, Berkshire County.
Palmer Hatchery, Hampden County.
Sutton Hatchery, Worcester County.
Sandwich Hatchery, Barnstable County.

Rearing Stations.

Up to the present time we have been able to hatch many times more trout and salmon than we could rear to the fingerling stage. Rather than liberate the fish as fry, we have decided to build a series of rearing stations which will be operated from April to October.

It is planned to locate these stations in sections of the Commonwealth where the fish are to be finally liberated. This will mean a large saving in transportation charges, and make possible the planting of all fish within a few hours after leaving the hatchery. One such temporary station built at Andover last spring, consisting of 50 troughs 16 feet long, 3 feet wide and 18 inches deep, placed in tandem form, was operated very successfully. Ample water was obtained through a 6-inch pipe from a reservoir above. Though the present situation

may not be permanent, it has very well proved the efficiency of such a system. Three hundred thousand young Chinook salmon were maintained last year from May until the 15th of August, when they were allowed to enter the Shawsheen River, a tributary of the Merrimack.

If present plans materialize, a similar station will be established in the course of another year.

The Acre Fish Pond.

There is scarcely a farm which does not possess some natural pond or some swamp in which an inexpensive pond suitable for raising fish could be made. Unfortunately, the possibilities of small ponds for food production have, up to the present time, been little recognized. In Europe the raising of fish in private ponds is a commercial means of increasing food supply, an item worthy of much consideration in these days of the high cost of living.

An acre fish pond can be constructed with a small outlay of capital, and can be maintained at a slight expense. Thousands of pounds of fish may be annually produced from such sources. Is that not a good business proposition? This Commission is ready at all times to furnish advice and information to any citizen of the Commonwealth who desires to construct a small fish pond.

Introduction of New Fish.

Artificial propagation, and introduction of new species of fish to local waters, has proved a success in many instances. The large and small mouthed black bass, pike perch, brown trout and other fishes have been introduced into the waters of Massachusetts. The brook trout, an inhabitant of the eastern part of the United States and Canada, is now found throughout the Rocky Mountains, as well as in foreign countries, and the successful introduction of the rainbow trout into New Zealand is a well-known fact. Several western fish such as the catfishes and the crappie, an excellent pan fish, might successfully be introduced into Massachusetts waters in suitable locations.

In Rhode Island and Pennsylvania the experimental work in the propagation of the Ohio bluegill sunfish has already yielded

satisfactory results. Commissions of many western States and the United States government have for years propagated this species. It has been demonstrated that they are easily reared, and that the young will make rapid growth, attaining a length of $1\frac{1}{2}$ to 2 inches during the first season. In numerous ponds where there are few or no sunfish the introduction of this species might prove of value, not only from the standpoint of the fishermen, but also as an aid in the extermination of the mosquito.

Bluegill Sunfish and Yellow Catfish.

Arrangements have been made to secure early in 1917 a brood stock of bluegills and yellow catfish in Pennsylvania for delivery to the Palmer Hatchery next spring. They will be placed in one of the breeding ponds, and thus a start will be made in what we expect to develop as a large addition to our stock.

To have the bluegill sunfish prevalent in our ponds and streams, for it is adapted to both, will be a great asset. It grows to a length of nearly a foot, and some weighing as much as 2 pounds have been recorded, though the average is about 8 inches with a weight of less than a pound. Size is dependent largely upon environment. In the larger ponds and streams it attains a greater size than in the smaller bodies of water. In shape its body is elliptic, the head comprising about one-third of the total length. Color varies with age from light to dark green, the young having silvery sides tinged with purple, and many vertical greenish bands. It is readily taken by hook fishing, and is considered an excellent pan fish.

The yellow catfish is a robust fish having a rather broad head and a wide mouth. Usually the upper jaw is longer than the lower, though they are sometimes equal. This fish thrives to greatest advantage in large ponds and sluggish streams. Living under most favorable conditions a length of 2 feet has been recorded, though the average is very much less.

Wall-eyed Pike.

We have received several reports of pike perch having been taken in the Connecticut River near Springfield. Considerable numbers are annually taken in the stream farther up and in the

Interior of the new Palmer Hatchery, showing battery jars for hatching yellow and pike perch.

Deerfield River. We began stocking the river in this locality with these fish in the spring of 1913, and expect soon to hear that they are to be taken in considerable numbers.

The pike perch, by reason of possessing the good attributes common to both game and food fishes, is a very valuable acquisition to our stock. Its firm, white, flaky, well-flavored flesh makes it particularly desirable. It has a long, moderately deep body with slightly projecting lower jaw, and a color approximating a brassy olive. On the sides there are about seven oblique dark bands, differing in direction, and a jet black blotch is located behind the last spine of the dorsal fin. Under most favorable conditions the species is said to reach a weight of 50 pounds, though the average is less than 5. It is a bottom feeder, prefers clear waters, and lurks under submerged rocks and logs, whence it can readily dart upon its prey.

Spawning takes place in May, and continues until early in June, the period of incubation varying from fourteen to thirty days, according to the temperature. A single female contains from 200,000 to 300,000 eggs, and the proportion of these which may be hatched artificially is enormous.

Chinook Salmon.

The transplanting of the Chinook salmon into Massachusetts waters is being further extended. The young fish are hatched at our stations from eggs obtained from the Pacific coast, and are liberated in September and October as fingerlings. Several deep lakes which possess the natural qualifications for this fish are being stocked and the results awaited with keen interest by sportsmen and State authorities. Already our efforts are beginning to yield results. In 1916 a Chinook salmon was caught in Onota Lake by Mr. Moses Delphia of Pittsfield, which measured $17\frac{3}{4}$ inches and weighed 2 pounds, 13 ounces. This was the first salmon taken since the lake was stocked on Oct. 30, 1914. Salmon weighing over 1 pound have also been taken from Big Alum Pond, Sturbridge, which was stocked in 1914. We caution the public to consider this work as an experiment. Even if it develops that these fish do not thrive as we anticipate, there will be the advantage of settling a much-discussed question, and the Commission will be credited

with being alert in trying out new ideas in fish culture. As yet no experiments along this line have been given a thorough enough trial to furnish conclusive evidence. Six hundred thousand Chinook salmon eggs were received from the Oregon Fish and Game Commission in excellent condition, of which 15,000 were sent to the Sandwich, 10,000 to the Adams, and 575,000 to the Palmer Hatcheries. At the Palmer Hatchery the small fish were transferred to the outside rearing pools in the latter part of March. During May and July 300,000 fingerlings, size Nos. 1 and 2, and during September 25,000 fingerlings, size No. 4, were shipped to the Andover rearing station. Here they were maintained in similar rearing pools until early fall. These pools are located on the edge of a small pond connecting with the Shawsheen River, which in turn empties into the Merrimack. The flashboards are pulled out of the pond and the salmon are permitted to work down stream, thus providing them with a natural run to salt water. This experiment, which will go far toward determining whether the western salmon can be acclimatized in the Atlantic Ocean is being watched by fish experts the country over. Eggs used were taken from the fall run of fish near the mouth of the Columbia River. The return of these fish as adults up the stream as far as the Lawrence dam will prove it a success and establish whether or not fall eggs produce spring fish. Results will not be evident for four years at least. Your Commissioners are determined to give this experiment a thorough trial, and will continue to put annually into the Merrimack an increasing number of these splendid fish.

Landlocked Salmon.

More than 19,000 landlocked salmon were reared at the Sandwich and Adams stations during the past year, and were liberated during September and October as fingerlings in the following lakes, the outlets of which are screened to prevent the escape of the fish: —

(1) Lake Attitash, Amesbury.
(2) Sheep Pond, Brewster.
(3) Lake Quinsigamond, Worcester.
(4) Onota Lake, Pittsfield.

We believe that early attempts to stock our lakes with these fish failed because the fish which were planted as fry were largely devoured by other fish, and what few remained were allowed to run to the ocean.

Shad.

One of the principal objects of the visit of Commissioner Graham, to the Pacific coast in the fall of 1915, to attend the convention of the American Fisheries Society and the National Association of Game and Fish Commissioners, was to investigate the possibility of obtaining an annual supply of shad eggs through the California Fish and Game Commission. In this connection it is worthy to be noted as one of the most remarkable feats of propagation that the small number of shad fry which were transplanted from the Connecticut River in the early 70's had established themselves in the streams of California, and at the time of Commissioner Graham's visit had become so prolific that the buck shad were being sold for $10 a ton, and the roe shad for $25 a ton, at the canneries, and that 100,000 pounds of shad roe had been canned during 1915. Why should it not be possible to reverse the process, and bring the shad back to Massachusetts? We believe that with modern methods of fish culture, and with improved transportation facilities, we would be able to transport large numbers of shad eggs across the continent and again stock our depleted rivers.

In conjunction with the Connecticut Commission we asked the California commissioners to help us, and at their suggestion had Mr. W. H. Shelby, superintendent of hatcheries for California, erect a temporary egg-taking station at Yuba City on the Farther River, which is a tributary of the Sacramento River. Arrangements were made with the express companies to transport the cases of eggs to Massachusetts in a refrigerator car which provided a uniform temperature en route.

After this station was finished and ready for use the weather conditions proved such that it was not possible to secure enough ripe eggs within the necessary period to make up a shipment of any considerable size. The cold rainy weather prevented the ripe shad from running up to their regular spawning beds. However, enough eggs were taken by the

men in charge for experimental purposes, and it was found possible to take and harden these eggs sufficiently for handling. They were then placed in cold storage and held for six days, which is sufficient time for shipment across the continent, and they were then hatched in perfect condition.

We feel sure that during the coming spring we shall secure a large number of shad eggs from this station, and we are greatly indebted to the California commissioners and Mr. W. H. Shelby, who have so kindly given their assistance and personal attention to this work.

The California Fish and Game Bulletin for October, 1916, describes the handling of shad eggs at the Yuba City Shad Hatchery as follows: —

> The experiments in fertilizing and hatching a high percentage of the eggs, and in keeping them free from fungus and bacterial infection, were successful. The avoidance of bacterial infection is very important in propagating eggs of shad and striped bass. While no shipments were made east, experiments made in holding the eggs for shipment demonstrated that they can be successfully shipped to eastern hatcheries in shipping cases. Next season it will be possible to furnish Massachusetts and Connecticut with shad eggs for their hatcheries, as well as to hatch a liberal supply for our rivers.

Hon. Frank M. Newbert, president of the California Fish and Game Commission, in a paper read at the meeting of the National Association of Game and Fish Commissioners in New Orleans said: —

> I predict that in the near future California will be able to add millions of shad and striped bass to her already plentiful supply, and we hope to assist in restocking the waters from whence they originally came, and in a small degree repay the debt California owes our brethren of the eastern States.

Apparently the problem of obtaining sufficient eggs, which at the present time is the greatest obstacle to hatching, is at least partially solved. In 1915 the Legislature appropriated the sum of $6,000 with which to erect a shad hatchery on the Taunton River. Owing to our inability to locate a satisfactory supply of eggs we have allowed the appropriation to lapse. The shad fishery is too valuable to be neglected, and when the

supply of eggs is positively assured, as appears most likely from the California experiments, we expect to ask for another appropriation with which to establish such a hatchery.

Black Bass.

The black bass is perhaps ounce for ounce the gamiest of our game fishes, and affords the fisherman great pleasure. The popularity of the black bass is steadily growing, and demand for them for stocking our inland waters is increasing each year. Of all our game fishes they are the most prolific under natural conditions, but the success of their propagation depends entirely upon the impregnation of the eggs and weather conditions, particularly sudden changes in temperature. The present closed season, good in itself, should be further extended from June 20 to July 1, when the great majority of the spawning fish will have laid their eggs.

At the Palmer Hatchery the number of hatchery ponds for rearing and breeding bass is being increased as fast as facilities and appropriations will permit. It is the general policy of the Commission to stock only those ponds in which black bass are already present. During the past season seven great ponds on Marthas Vineyard were stocked with black bass and wall-eyed pike, to the decided approval of the local sportsmen. The ponds stocked were Chilmark, Great Homer's, Watcha, Edgartown Great Pond, Tashmoo Lake, Oyster Pond and Tisbury Great Pond.

Trout.

The work of stocking the smaller streams with brook, and to a lesser extent the large streams and ponds with rainbow, trout has been successfully carried on. More fingerlings than ever have been distributed in all parts of the State, to the intense satisfaction of the fishermen. The results in many brooks selected after a preliminary survey are being followed with keen interest. At the present time the Commission has on file a report on practically every stream in the Commonwealth as regards its physical characteristics, location and the species of native fish, as well as those artificially introduced. While there are good arguments in favor of distributing trout fry, our aim is to put out as many fingerlings as we have fa-

cilities to raise. Substantial numbers of fry are planted each year, but as a by-product resulting from the necessity of thinning out the fish in the rearing pools at the hatcheries.

White Perch.

The white perch is both a gamey and an excellent pan fish, and for all classes of fishermen is perhaps the most satisfactory pond fish for our State. Your Commissioners believe that the most important work of fish distribution lies in the stocking of our inland waters with food fishes as well as game fishes. By increasing the natural production of our ponds with food species the general public will not only be given the recreative benefit of catching these fish, but, at the same time, will be provided with an important food product which will do much toward lessening the high cost of living.

Small adults seined from the brackish water of Oyster and Salt ponds in Falmouth, and from the water supply reservoir at Newport, R. I., have been shipped to the inland ponds, where this species becomes landlocked. The transplanted fish multiply rapidly, and, if sufficiently protected, soon provide an enjoyable source of fishing. We have never been able to fill all the applications for these fish in any year since we started this work. Each year the number of unfilled applications has increased, showing the growing demand.

In view of the possibility of depletion in the natural supply of young fish for stocking we made several attempts to secure white perch eggs. On Marthas Vineyard and on the mainland there is an annual run of white perch coming in from the ocean to spawn. Last year several hundred large, well developed perch taken in one of the Vineyard ponds were placed in pounds and examined at intervals, but they invariably became covered with fungus before becoming "ripe." During the coming year our plan is to collect a larger number, earlier in the season, confining them in a natural pond. We are of the opinion that we will eventually solve the problem and will be able to take each year a large supply of eggs. These we can readily hatch in the batteries at the Palmer Hatchery, and by placing them in large artificial ponds we will be able to distribute substantial numbers of fingerlings annually.

Bullheads.

The bullhead or horned pout (*Ameiurus nebulosus*) has been in years past a much-maligned fish, as its appearance is deceptive so far as its edible qualities are concerned. At the present time from a purely gastronomic standpoint, there are few fish considered as fine eating as this ugly specimen of the finny tribe. It is a hardy fish, readily yields itself to pond propagation, and is always in demand in the market.

This species has a wide distribution, and is found in nearly all Massachusetts ponds where the conditions are satisfactory for its existence. It is usually to be found near the bottom in muddy, weedy ponds, where it will take practically any kind of bait, to the delight of the youthful fishermen.

For the past few years the young of this species seined from certain well-stocked waters have been placed in the inland ponds, particularly in the north central part of the State, where it is popular among the anglers. During the past year artificial propagation has been started at the Palmer Fish Hatchery, and 52,900 size No. 1 fingerlings have been reared and distributed from this station, while 44,000 have been obtained elsewhere in the State for stocking purposes. There is a rapidly growing demand for these fish. The Commissioners contemplate experimentation with some of the larger river and lake catfish.

Smelt.

The smelt fishery in Massachusetts is in a depleted condition, and strenuous and radical measures will be required to save this species from extinction. The only available natural breeding grounds of importance are the Weymouth Back and Fore rivers, particularly the former. To this locality each year thousands of smelt resort for spawning. Unless steps are soon taken to prevent it, even this last breeding ground will soon be past history because of the depredations of man.

Plans are now under consideration toward protecting this locality as a reservation where a station can be established for obtaining the smelt eggs, the majority of which would otherwise perish, and from which the collected eggs could be distributed for restocking other coastal streams, possessing suitable

spawning grounds. Only by this means can the smelt fisheries of our coast be maintained and replenished.

We have continued the successful experiment of propagating the smelt in the large fresh-water ponds by planting the eggs in the tributary brooks. The landlocked smelt furnishes a most excellent form of food for the larger fresh-water fish, and in this respect is of great advantage for the ponds stocked with salmon and bass. During the year 1916 approximately 34,000,000 smelt eggs obtained from East Weymouth and from the spawning grounds in the large ponds were planted throughout the State.

During the ensuing year we plan to conduct experiments in stripping and in the artificial hatching of smelt eggs, with a view to determining the practicability of handling the eggs at our hatcheries.

Fish Distribution.

Your Commissioners are firmly of the opinion that the best results can be secured by planting both fingerlings and excess fry, especially the former, as well as by the exercise of judgment and care in distribution. This latter problem is in process of solution by an examination of all the ponds and streams, so that first-hand information as to the suitability of any body of water for stocking will be available.

Of special interest is the use of automobile trucks in stocking streams and ponds. In many cases fish are taken directly from the hatchery without shipment by railroad. The advent of the automobile has added much to the speed and convenience of fish planting.

To insure smooth operation in the actual work of fish distribution entails many exacting details which have to be met by the messenger in charge of the consignments, and for this reason specially trained men only can be employed.

The process of distributing fish can be outlined briefly as follows: —

(1) Lists containing names of persons to receive fish, addresses, names of different bodies of water, etc., are delivered to the superintendents of hatcheries, who, in turn, make up the shipments and assign them to the messengers who are to handle the fish.

(2) The messenger must so route his shipments that there will be no needless duplication of travel.

(3) Train service especially for distant localities must be arranged so that delays are reduced to a minimum.

(4) All applicants must be notified at least forty-eight hours in advance of the exact time of arrival of the fish, including the number and size of cans.

(5) When necessary the services of the district deputies are required to take over certain shipments to enable the messenger to return to the hatchery in time to handle another assignment.

(6) Teamsters must be engaged in advance.

(7) The empty cans must be returned to the hatchery as soon as possible by railroad shipment.

(8) The fish and messenger are transported in the baggage cars by the courtesy of the railroads.

(9) The messenger must continually watch the aeration of the water to insure the delivery of the fish in good condition.

(10) The baggage men at the various stations must be notified ahead to provide extra trucks for handling the fish cans. At the South Station in Boston, through which many shipments come, a special truck is owned by the Commission for the expeditious handling of the fish.

(11) All shipments must be properly iced to insure having the right temperature. Having a suitable supply on hand at certain shipping points is often quite a problem.

Directions for Fish Distribution.

Owing to our limited force for handling this large work we are often compelled to turn shipments over to individuals at the railroad stations. The greatest loss of fish results from improper handling and depositing in pond or brook. For the guidance of the persons receiving the fish we give the following information: —

Keep temperature in transportation as even as possible. Aerate by dipping the water and pouring back into can.

Do not leave any cans of fish standing but a few minutes without aerating.

Fish on trains or other conveyances, while in motion, do not need

as careful watching. Remember always that it is the dissolved oxygen in the water that the fish need. You can aerate too little. You cannot aerate too much.

Before liberating any fish a quantity of water should be put into the cans from the brook, stream or pond and aerated a few minutes until the temperature becomes within a few degrees of being the same in the cans as in the brook.

Trout. — Small trout and salmon should have enough ice to keep the water at the same temperature as at starting point, and the water should be aerated every ten or fifteen minutes. Distribution should be scattered over as large an area of brook as possible. Trout fry should be placed in the head waters, springs and small brooks; fingerlings lower down; adults in the deep holes.

White Perch. — White perch fingerlings are cared for in much the same way as trout, except that great care should be used not to get the temperature below 54 degrees F., or, better still, keep as near the temperature of destined pond or stream as possible. Use small quantity of ice. If too cold it is likely to be fatal to the fish. Liberate in deep water if possible.

Bass. — Bass are warm-water fish, and require very little ice except on very hot days, and then only in very small quantities. Keep the temperature even. Bass fry and fingerlings should be liberated in the weeds along the shore if possible. Small-mouthed bass are best for sandy or gravelly bottom ponds of good depth, while the large-mouthed will be all right for a muddy bottom and shallow water.

Bullheads. — Pouts are a very hardy warm-water fish. With very little aeration they may be carried almost indefinitely. They thrive best in muddy ponds.

Smelt. — Landlocked smelt ordinarily do not need ice. They should be liberated on the edges of ponds with tributary streams. The adults serve as food for the larger fish.

Smelt eggs should be placed in running streams with fair current and sandy bottoms. Keep cool, but do not chill.

Pike Perch. — Pike and yellow perch fry are very small, delicate and nearly transparent. Ice should never be used. They will stand high temperatures, and will thrive in ponds where white perch do well.

In aerating, a copper screen which keeps the small fry away from the dipper and the splash of the water should be used. Little aerating is necessary, and the fry will live in good condition for thirty to forty-five minutes without aeration.

Liberate yellow and pike perch fry in small quantities over a wide area in the grass near the shore, where food may be found. Keep the cans covered lightly to prevent strong light from entering, since the fish are inclined to congregate in the bright light, and in so doing may smother.

Dippers and screens should be returned with as little damage as possible in boxes provided for that purpose. See that all cans are properly tagged and returned at once to the hatchery.

Fish Salvage.

In the town of Falmouth, seining of white perch is carried on in the spring, and in the fall from November 10 until the ponds freeze. Several new locations will be tried out for a fresh supply, in order that the used ponds may restock naturally. Bullheads have been taken with traps from private ponds in the Hubbardston Reservation. Bass have been obtained from North Watuppa Lake at Fall River. Landlocked smelts have been distributed to ponds from Onota Lake, notably those stocked with salmon. In several instances, during high water in the rivers, stranded fish were rescued from the overflow.

In the future the work of the salvage of fish will play an important part in the activities of the Commission. Plans are now under way toward extending this work to private waters, particularly reservoirs and other ponds where public fishing is prohibited, in order to place the fish from these waters in places available to the fishing public. Likewise, more extensive work is contemplated in rescuing stranded fish from streams in times of overflow or during drought. By this means thousands and even millions of adult fish can annually be provided for the public waters in addition to the output of the hatcheries.

The proper performance of this important work will entail the services of specially trained men, who will devote to it their entire time for several months each year. A large automobile truck fitted with the requisite equipment for salvage, such as

seines, pounds, boat, fish cans and working tools is absolutely necessary for successfully conducting this operation.

Field stations for collecting fish for distribution have been established in Falmouth, at North Watuppa Lake in the city of Fall River, and on Marthas Vineyard.

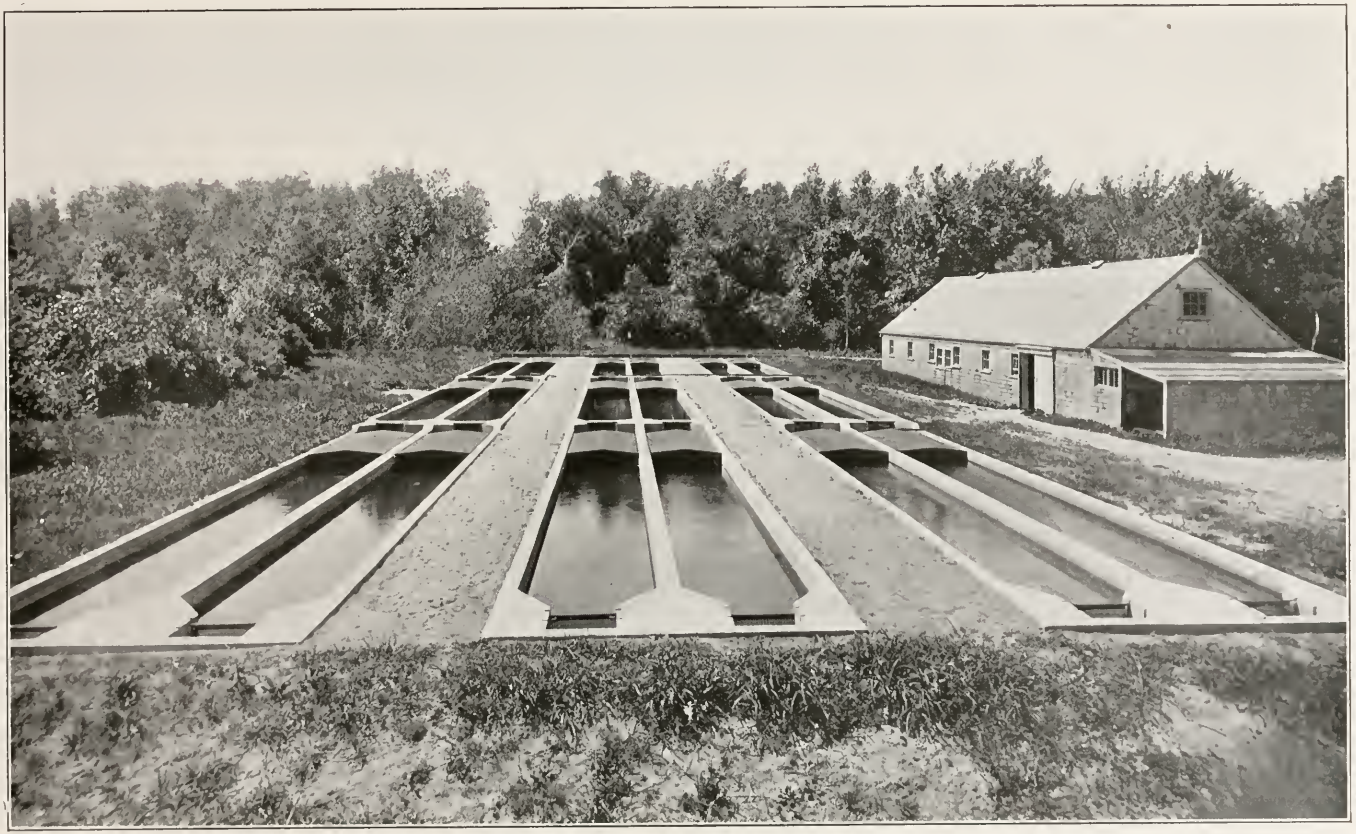
Sandwich Hatchery.

The Sandwich Hatchery is fast becoming one of the sight-seeing attractions on the Cape. The road from the highway has been put in first-class condition, so that automobiles can run as far as the hatch-house. During the past year 608 visitors registered at the Sandwich, and 735 at the East Sandwich station, representing twenty-three States and four foreign countries, in addition to numerous persons who did not sign the record book. At East Sandwich visitors should inspect Superintendent Hitchings' fine collection of preserved salmon and trout, as well as other fresh and salt water fish, showing the various stages of development in the egg and fry.

When this hatchery (consisting in reality of two stations about 4 miles apart) was purchased, all of the pools were shallow with board sides. These are being gradually replaced with concrete pools which have already proved their worth. These ponds average 50½ feet long, 6 feet wide and 4 feet deep. The death rate in cement pools of this type is about 75 per cent. less than in the old-style pools. At the Sandwich Station the main road was made wider, new screens and egg trays were built, the underbrush was cleared up around buildings, the meat house was moved across the road, lengthened 8 feet and sheathed inside, and a cement floor and chimney were installed, so that it is now possible to keep the building warm in winter. We have also acquired several acres of land, giving us the entire control of the water rights. In our budget, covering new construction work for the coming year, we have asked for a new series of concrete pools, which, when installed, will take care of all of the water supply, thus finishing the developmental work at this station for trout culture.

At the East Sandwich Station, in addition to the cement ponds, we have built an addition to the shop, providing a place

Sandwich Trout Hatchery, showing condition of rearing pools when purchased in 1911.



Sandwich Trout Hatchery. Same view in 1916, showing present system of up-to-date concrete rearing pools.

for storing shade boards, and a 6-foot addition to the stripping house, which will be used for an experimental station for hatching eggs. The grounds have been graded, a new lawn made in front of the shop, all brush cleared off, and the 6-inch water main tapped to supply water to the stripping house, instead of the old wooden flume. So far we have replaced sections of wooden pools with concrete. We have asked for an appropriation this year to replace another section with concrete. Our policy will be to do as much of this as possible annually, until we have enough concrete pools to utilize all of the water supply, and then we shall consider the station completed.

A Ford truck has been purchased to replace the old heavy truck. This not only facilitates the necessary travel between the two stations, but by selling the horse which we kept for several years, and using the truck instead of hiring teams, we believe a substantial saving on our bills for cartage will result.

Palmer Hatchery.

This station has been further developed during the past year by the completion of two additional bass ponds for rearing small-mouthed black bass, and by building a reservoir and pipe line from the Fortune property to the hatchery building. Here we collected three springs and brought the water down to the hatchery 150 feet below. It will be possible to add other springs to this same system in the future. The water will be used to supply the different houses for domestic purposes, as well as for the hatchery work.

In the carpenter shop we built 80 wooden trout-rearing pools, — 50 for the salmon-rearing station at Andover, and 30 for a station to be located next season. Superintendent Monroe supervised the building of the rearing station at Andover during the spring, and also established field stations on Marthas Vineyard and at Watuppa Lake in Fall River for taking white perch and small-mouthed black bass.

The new State highway from Palmer to Ware has been finished past the hatchery, thus affording better facilities for shipping fish and getting supplies.

This year the output from this station was larger than ever

before, and included Chinook salmon, rainbow trout, small-mouthed black bass, large-mouthed black bass, wall-eyed pike, yellow perch and bullheads.

Sutton Hatchery.

During the past year the Sutton Hatchery has been further developed as a fish-rearing station. In spite of certain adverse conditions which very much increased the amount of work, operations were conducted with more than average success. Its location makes it a most admirable distributing center for the central part of the Commonwealth.

In addition to hatching the eggs of the brook trout obtained from brood stock on the premises, large consignments were received from the Sandwich Hatchery and reared to fry and fingerlings. The propagation of the brown trout has been discontinued and the entire brood stock of mature fish have been liberated.

The work of improvement was largely of a replacement nature, though plans of new construction, bringing the station to a more finished state, were undertaken. An extensive section of the main brook was walled with stone and concrete in which frames for flashboards and screens were set at intervals to permit of the channel of the brook being used for fingerlings in the latter part of the season. The roof of the hatchery building and the hatching troughs have been repaired in preparation for the work of the coming year.

Adams Hatchery.

At the Adams Hatchery and rearing station valuable work has been accomplished in the way of local distribution of fish among the streams of Berkshire County. This plant has been developed from a fry-hatching station, operated only a few months of each year, into a fry and fingerling hatchery. It is now worked practically the whole year round. This hatchery is dependent upon the other stations for its stock, which this year consisted of brook trout, Chinook salmon and landlocked salmon. The first were hatched, reared and distributed as fry and fingerlings; the two latter as fingerlings. Results in a

East Sandwich Trout Hatchery, showing condition when purchased in 1911.

East Sandwich Trout Hatchery. Same view in 1916, showing general improvement in rearing pools and grounds.

general way were very good, even better than anticipated, except in the case of the landlocked salmon, which failed to mature as rapidly as usual, but which otherwise did exceptionally well.

Improvements during the past year include a concrete bottom in the lower part of the pond, the installation of a proper drainage system, and the construction of a basin around the spring to insure obtaining the maximum amount of water. Our present plans will increase the capacity of the station to the extent of keeping 600,000 trout fry in growing condition from January to April. This will probably represent the maximum capacity to which it is possible to develop this place, owing to the fact that the water supply is limited. Therefore we do not expect to ask for further appropriations in the development of this station.

Frog Farming.

It must be admitted that the humble frog is a valuable friend to all, and a real asset to the agriculturist. Generally it is not known that there exists no greater destroyer of the insect family. While in the tadpole stage it subsists entirely upon living organisms such as the mosquito wiggler, and as an adult greedily devours the cutworm, grasshopper, army worm, mosquito and countless other forms of insect life which annually take a billion dollars out of the pockets of the farmers.

The point has now been reached where a real "frog business" can be established profitably. The dealer is assured of never wanting a market for his product. He may furnish frogs to colleges for experimental and educational purposes, to zoölogical gardens and menageries for snake feeding, and may sell to hostelries for table use. The farmer may well add to his revenue by utilizing the little old unused swamp for frog rearing. Artificial propagation, if resorted to extensively, would insure perpetuation, and at the same time be attractive as a financial investment. Already steps have been taken in the State of Pennsylvania to protect the frog by providing a legal closed season during the months of March and April.

Pollution.

In view of the increased output of fish from the State hatcheries it is essential that the streams and ponds be made fit to receive young fish. In order to supply suitable grounds unnecessary pollution of our streams must be eliminated. The Commission has accumulated definite data upon the pollution of the fishing streams in Massachusetts, and efforts are being made to eliminate all types of such as are detrimental to fish life. It is realized that certain streams are so saturated with pollution that it would be practically impossible to reclaim them, and that in many instances radical enforcement of the existing laws would result in economic loss and involve the Commonwealth in endless litigation. Nevertheless, two things can be accomplished, (1) the prevention of further pollution from manufacturing and sewage sources, and (2) the elimination of unnecessary pollution upon the streams of potential fishing value.

Fishway Construction.

One of the problems which this Commission has to meet is the installation of proper fishways, particularly upon the alewife streams of the coast. Your Commissioners are considering requiring the installation of adequate fishways wherever necessary for the welfare ot the fisheries. We expect to furnish definite directions for construction, with blue prints in each case, and the owners of dams will be required to build fishways satisfactory to this Commission.

We take this occasion to say that in the main we have found owners of dams and water privileges ready and willing to co-operate with us. In turn, we have endeavored to impress upon one and all that our desire is to install these fishways in proper manner, with as little expense to those affected as possible.

GAME.

Increase of Game.

It is a pleasure to report the beneficial effect of the migratory bird law upon the number of waterfowl frequenting our shores, and even breeding here. We believe that more black ducks have bred in the State during the past season than for many a year. Deer and pheasants are holding their own in spite of open seasons. Quail have done well except in the severe weather of last March, but the ruffed grouse have apparently suffered. The history of bird life is the same in every State where rigorous winter weather is experienced. The birds increase substantially for a time, then undergo a killing period of short duration during which their numbers are much decreased. The evil effects of this may be partially offset by the measures described in this report for preserving the quail through the winter. The cold and very wet spring and summer took an unusually heavy toll.

The sanctuary or reservation is a logical method of bird preservation. A small piece of land sown with small grains for the purpose of feeding birds through the deep snows of winter would greatly add to the value of the work accomplished in such cases. Here wild birds are given every assistance in multiplying under a natural environment. The Commissioners are extending this work to game farms and posted reservations, and expect that the birds raised and protected under such favorable natural conditions will increase rapidly, and gradually work into more depleted territories.

Insectivorous Birds.

The protection of insectivorous birds is a matter of vital importance to the agricultural interests of this country. New pests are continually arising to accomplish considerable damage before they can be exterminated or even subdued. The decrease in bird life has shown itself in a corresponding increase in these pests. Throughout this report will be found statements directed toward the systematic protection of the birds.

The control of the hunting house cat and vermin, the feeding of the birds in winter, and the establishment of permanent reservations, as well as taking away from the alien the right to have shotguns and rifles, are the principal agencies to increase our song and insectivorous birds.

The Sparrow.

One of the greatest pests in Massachusetts is the English sparrow, an introduced species. It is driving out the native birds, and increasing at an alarming rate. The movement is now being agitated throughout the country to substantially reduce the numbers of these birds, and a real crusade is under way, which meets with the hearty approval of your Commissioners. We believe that a unified effort should be made to exterminate or reduce this pest, provided, of course, that a plan can be agreed upon which will result in the birds being humanely killed.

The work should be done by experts. In the overzealous efforts of ignorant persons there is danger to our native sparrows, which are unrivaled as weed destroyers. These little birds, which are both insectivorous and great eaters of weed seeds, are most assuredly the friend of the farmer, and should be made familiar to all.

Quail.

As stated in previous reports, we believe the quail offer the most promising results in the artificial propagation of any of our native game birds. Our game farm at East Sandwich is devoted almost entirely to this work, and we also are conducting some activities at the Marshfield Bird Farm. The main lines of work consist in obtaining the largest possible production of fertile eggs. These are hatched under bantams, and at an early age the hens with the young birds are placed on a range in natural quail country. Here the young, while fed and cared for, are given every encouragement to "grow up" and shift for themselves. We are of the opinion that the proper time to distribute them is when their wild habits are being developed, and when they are unaffected by too much care and attendance.

Various conditions combine to make the maintenance of our

Young quail hatching under hen at the East Sandwich Game Farm. Nesting box is shown at left.

stock of quail more difficult than that of the grouse and pheasants. We refer to the rigors of winter. History shows that so long as we have mild winters quail will increase despite shooting. Then, all of a sudden, comes a period of severe weather, and the flocks are so decimated that the work must start all over again. This combined with the ravages of the horde of hunting house cats, to say nothing of the other natural enemies, presents the problem with this ground-nesting and roosting bird. We venture to say that if the losses due to severe weather and vermin can be substantially eliminated, even larger opportunities to hunt the birds might be provided, and still the birds would rapidly increase.

Quail can stand colder than zero weather, provided they have food and grit, and can roost in a place free from the danger of being covered by heavy falls of snow which by the formation of crust imprisons and starves them.

Feeding stations must be maintained steadily at certain favorable places where the birds will easily find them. These localities must be protected especially from vermin and poaching. In addition, an increasing number of acres must annually be planted with such grains as wheat, buckwheat, rye, kaffir corn and sunflowers, to be left for the birds in the fall and winter. The difficulty is to obtain a kind which will not be beaten down and covered up with deep snow. For this reason experiments should be carried on with various seed-bearing shrubs.

To establish a feeding station clear away the snow to the ground. Place grain and grit (which may be coarse sand) in hay chaff, barn sweepings or straw. Build rough shelters of boughs so that good-sized areas will be left free of snow. Leave plenty of open space so that the birds may get out easily when attacked by vermin. Here scatter the feed. A simple shelter can be made by piling brush against a stone wall or fence with large openings at either end.

These are simple instructions which can be carried out by even the busiest sportsman or bird lover. Or, if too engaged, the owner of the land on which you hunt will, in most instances, be willing to do it for a small sum. It's up to you, Mr. Sportsman. You can have the birds if you will keep them.

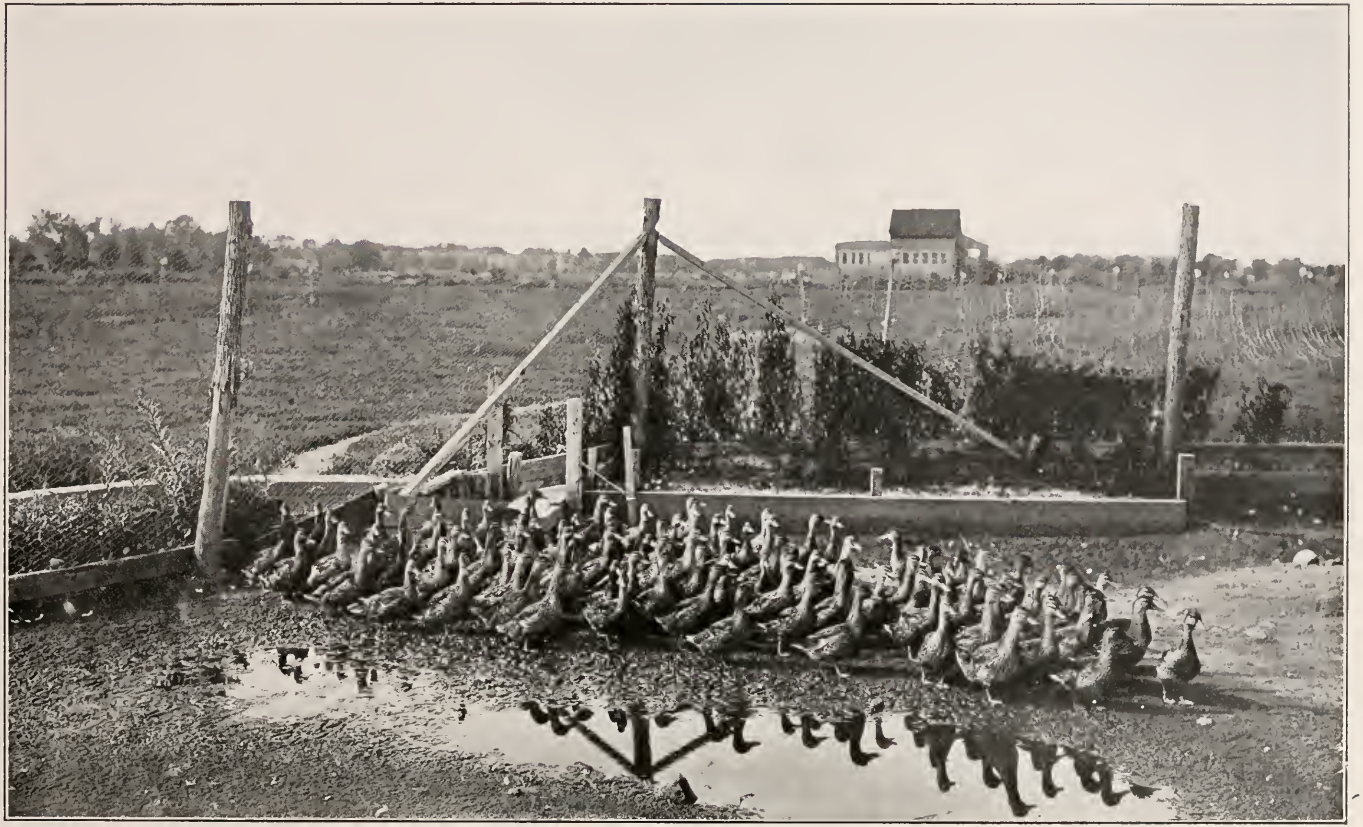
Pheasants.

How many pheasants are there in the State of Massachusetts? Most reliable estimates put it at some 100,000, not including those kept at the State game farms. The large supply of these birds shows the result of adequate protection coupled with extensive propagation. This game bird was introduced into Massachusetts in 1894. At the present time the ring-necked variety forms the entire output from our game farms. The production of the Reeves pheasant has been discontinued.

In 1914, 8,943 were killed during the open season, but in 1916 only 3,133, which was due not so much to lack of numbers as to the increased wariness on the part of the bird. Yet there are persons who maintain that the pheasant is as "tame" as a domestic fowl. Certainly since the first open season the birds seem to exhibit a surprising celerity in repossessing themselves of their natural instincts, by no means the least of which is the evasion of hunters.

At various times considerable discussion has arisen as to the injurious effect of the pheasant upon the ruffed grouse. We have tried to obtain affidavits from people making such claims, but have been unable to obtain any trustworthy evidence so far. Observations show that the pheasant usually frequents an entirely different cover than the grouse. Although they may be found in grouse country, they prefer the tall grass and swampy areas along the water courses. Mr. William L. Finley, biologist of the State of Oregon, made the following personal statement to Mr. William C. Adams, chairman of the Massachusetts Commission on Fisheries and Game: —

> Prior to the liberation of Chinese, or ring-necked, pheasants in Oregon, ruffed grouse were perhaps more abundant through the Willamette valley than through any section of the State. Pheasants were first liberated in the Willamette valley and multiplied very rapidly. Since that time ruffed grouse have decreased in number, but I do not believe it comes from other than natural conditions; that is, clearing out patches of brush, cutting trees and draining swamps. We have absolutely no evidence to prove that the Chinese pheasants have in any way been injurious to the ruffed grouse. They occupy the same country, yet the Chinese pheasants are largely birds of the field, while the ruffed grouse are birds of the thicket and deeper woods.



Wild mallard ducks reared at the Marshfield Game Farm.

From time to time we are urged to close the season on pheasants. To this we are inclined to say that these birds were put into our covers primarily as a game bird; that their numbers can always be increased by the expenditure of money; and that they can be bred with reasonable ease. This cannot be said of our native game birds. Moreover, they direct a great amount of hunting away from the native game birds which furnish good sport.

Mallard Duck.

The beautiful mallard duck lends itself readily to artificial propagation, and is proving a great attraction at the game farms. By liberating these birds we are offering a new sporting proposition to the gunners of the State, since these ducks in certain localities do not migrate. Not only in themselves are they a benefit, but they are of value in attracting the black duck to these places. Each bird when liberated has an aluminum or brass tag placed on its leg bearing a number. Every hunter who kills one of these tagged birds will confer a favor upon the Commission by reporting the number on the tag, date, sex and locality where shot, together with other facts of interest concerning the condition and weight of the bird. Last May a pair of wild black ducks nested in the Boston Public Gardens, and reared five young. There are thousands of acres of marsh and swamp land which should be the breeding grounds for these birds. They too need protection from their natural enemies, two of the most deadly of which are muskrats and large turtles. We urge all persons who receive the young ducks not to feed them, but to place them in suitable natural cover and let them shift for themselves. This will develop their wild instincts which are not as strong as is the case with young quail and pheasants when liberated.

Heath Hen.

The Commissioners are continuing to guard with care the only colony of these birds in existence. The work consists in planting enough crops to afford sufficient winter feed, patroling the reservation against poachers, and in keeping up an endless warfare against vermin, the most troublesome of which is the

wild house cat. The reservation is 4 miles from the nearest town, the nearest house where there is a cat 2 miles distant, and yet we kill on an average of 15 cats on this reservation each year. It is estimated that there are now present on the island of Marthas Vineyard some 1,000 of this once nearly extirpated native game bird.

On May 12 a brush fire burned over an area of 13,000 acres (about 20 square miles) before it was checked. The heath hens which inhabit this area lost their nests and eggs, and, in addition, many rabbits and black ducks' nests were destroyed. In this crisis the people of Marthas Vineyard responded nobly, and by their whole-hearted assistance the fire was checked before irreparable damage was done. Superintendent Day of the Marthas Vineyard Reservation reports, concerning this fire, as follows: —

> I am afraid the heath hens did not increase in numbers; in fact, my opinion is that the birds just about held their own. Had the fire occurred three weeks later, I feel that the heath hens would have been a thing of the past, as the hens would all have been setting and stayed on their nests. As it was, large numbers of eggs were destroyed, and afterward, there being no cover, the birds dropped their eggs promiscuously in places where they were soon destroyed by crows. The old birds themselves were easy marks for the birds of prey. Ten skeletons were found within three weeks after the fire, notwithstanding the fact that there were a large number of hawks killed. Some of the birds nested again later.
>
> I take this opportunity of recommending that at least a few pairs of these birds be distributed in other sections, to evade the possible chance of their becoming extinct from forest fires or disease.

The proper course to be pursued in the restoration of this bird to the mainland is being studied. Their numbers by this time have attained such proportions as to warrant some diminution of the Marthas Vineyard flock for experimental stocking. Plans are now under consideration for liberating birds at suitable places, such as on Cape Cod, on No Man's Land, where Joshua Crane, Esq., of Boston has agreed to give them special attention, and on the 5,000 acre State forest located in South Carver, Plymouth County, where the character of the country and vegetation is very similar to that of the Vineyard. The prime reason for this step is to make doubly sure of perpetuation, in view of the fact that large brush fires, natural enemies

The heath hen or eastern prairie chicken, a rare game bird found only on the island of Marthas Vineyard. The Fish and Game Commission is now attempting to colonize this bird on the mainland.

or diseases of an infectious nature might have the effect of destroying all of the birds existing in the limited territory on Marthas Vineyard.

As a first move in this direction we shipped a consignment of this rare bird to the New York Conservation Commission on Dec. 23, 1916, for propagation purposes. These birds were successfully trapped on their native breeding grounds, and delivered to Superintendent Rogers, associated with the New York Commission, who personally transferred them to Shoreham, Long Island. Here the New York Conservation Commission has spared no expense in providing a house for them, and the residents of Long Island have enthusiastically responded to the plan to restore the birds to that section, where once they were more abundant than in any other part of their former range.

Cats and Bird Life.

The "Boston Transcript" of June 9, 1916, contained a little paragraph which furnishes all bird lovers with food for thought.

> June is the month when by far the largest number of birds of all species are raising their young, "American Forestry" tells its readers. It is also the month when the largest number of birds perish. The fledglings are killed by storms, by boys with slingshots or guns, and by marauding cats. Their worst enemy is the cat. Every owner of a cat should see that it is kept secluded at this time, and cats without owners should be mercifully exterminated. Only in this way can our native birds be conserved and attracted to our gardens.

An example of their destructiveness is found in the case of the Marthas Vineyard reservation, where Superintendent Day has to wage continual warfare in protection of the young birds. In 1916, 27 hunting cats were shot. These animals, abandoned by summer residents, revert to a wild state, and become a menace to our bird life.

On the South Carver Reservation, on Nov. 11, 1916, Superintendent Cushing shot a savage hunting cat which had been at large on the reservation for nearly a year. The specimen measured 3 feet, 5 inches from nose to tip of tail, and weighed about 22 pounds.

We earnestly urge that owners of cats take heed of this, and observe every precaution which will enable them to keep their pets under control during the breeding season for birds. We are not waging war on the pet "Tabby," friend of the fireside, but on the horde of homeless cats which roam our covers and breed in the open as wild cats, and which not only serve no economic purpose, but take an appalling toll in the way of our song, insectivorous and game birds. If you have never thought this over before, make a note of the number of cats you see in the open fields during the day, and that you "jack" with your automobile lights on country roads at night.

Reservations.

Under chapter 410 of the Acts of 1911 a number of reservations have been established. These areas comprise the land of private individuals, who, in accordance with the terms of this act, have allowed the Commissioners on Fisheries and Game to post the property, and in some instances, even, to do a small amount of constructive work such as planting grains for the winter feeding of birds. Usually the period of taking has been for three years.

While this type of reservation may serve a useful purpose, we feel that the correct solution can only be found in the permanent reservation owned by the State, and of sufficient size to warrant the employment of paid superintendents, who will protect against poachers, kill predatory vermin, plant grain and food-bearing shrubs, construct winter shelters for the birds, and feed them during severe winter weather.

The difficulties with the present system of reservations are, briefly:—

(1) Term of lease too limited.

(2) Certain owners of land inside the tract may refuse to extend the period of reservation, which would either break down the whole plan or else give them the opportunity to hunt over their own land, thus made particularly valuable for sporting purposes by having protected territory all around.

(3) Reluctance of individual owners, even after establishment of the reservation, to grant permission to representatives of this Commission to plant grains, shrubs and trees for the

A typical stretch of country on the Marshfield Reservation, where quail, ducks, pheasants and other birds are protected in their natural environment.

birds, lest the Commonwealth establish an easement which might be in the nature of a cloud on the title if they desired to sell at a later date.

(4) On careful analysis of the underlying reason why certain requests are made for the establishment of reservations, we find that the protection and increase of bird life is a secondary consideration, and that the principal consideration is the desire for additional posting to keep out the public. We believe that the act was primarily passed to afford increased protection and favorable breeding situations for wild life, and that it contemplated active work on the part of the Fish and Game Commission and owners to meet these conditions.

State Game Farms.

What is the Fish and Game Commission doing to game bird propagation? Look at the following list of game farms. Then, if you still doubt, pay a visit to any one of them. You will be welcomed as all visitors are, and when you leave, rest assured that you will have inspected some of the best modern methods of rearing game birds.

East Sandwich, Barnstable County.
Marshfield, Plymouth County.
Norfolk, Norfolk County.
Sutton, Worcester County.
Wilbraham, Hampden County.

From these game farms pheasants, quail and mallard ducks are being distributed into the coverts of the State each year for the benefit of the sportsman and the general public. Practical experience has demonstrated that the Canada goose is in the same class as the wild turkey in so far as artificial breeding in Massachusetts is concerned. We have discontinued propagating them, and have disposed of all flocks except a few specimens retained for educational purposes.

Marshfield Game Farm.

This game farm is situated at Marshfield, within 300 feet of the Marshfield railroad station on the State road, and is ever becoming a more popular point of interest to tourists and

summer visitors. It is an interesting location in that several years ago most game breeders argued that the more remote a game farm could be kept from populated districts the better. It should not be confused with the Marshfield Reservation which is entirely separate, and comprises a large tract of land lying around the farm, which was founded under the provisions of chapter 410 of the Acts of 1911.

Owing to the fact that we delayed somewhat in clipping our adult ducks, a large number flew away and bred in the Dyke Meadows (a most favorable locality). The result was that a smaller number of eggs were taken than if we could have collected from all of the ducks which we figured on at the beginning of the season. However, we consider this insignificant compared with the advantage gained in studying these birds when allowed to breed in the open. A satisfactory yield was taken from the ducks retained, and these, together with eggs shipped in from other stations, gave us a good working supply for the season.

By devoting the time and attention heretofore given to geese to the propagation of quail it is considered that far more satisfactory results will be obtained. Here we are carrying on the experiment of trapping a limited number of quail, taking their egg production from them, and then liberating them early enough to enable them to raise a brood in the open. The eggs taken are hatched under bantams. The results obtained so far encourage us to go on with the work.

Among the more important improvements made at the station during the past year may be enumerated the construction of a portable brooding house for young mallards, wired with electricity and supplied with water. This building measures 100 feet in length, 10 feet in width and is composed of six 15-foot sections made of match boards with anatite roofing. A "head house," in dimension 10 feet square, forms the middle. Six brooders were installed, one in each section, and proved a great success in raising the ducklings.

In addition to the routine duties contingent to the management of the game farm considerable work has been done in the way of caring for birds on the contiguous reservation. At regular intervals during the stormy winter season feeding sta-

Brood house and duck yard at the Marshfield Game Farm.

Interior of brood house for mallard ducks at the Marshfield Game Farm. Note the method for uniform heating.

tions were supplied with grain and grit for the sustenance of the quail, pheasants and partridges which are quite abundant in this locality. The work presents almost every phase from artificial propagation to care of the wild birds.

Wilbraham Game Farm.

The past year, as a result of careful work in organization, has proved the most successful since the establishment of the Wilbraham Game Farm. It has taken this time to get the land into its present shape, and the yards and coops and breeding pens into the best condition.

In the rearing of young pheasants an innovation was attempted. This consisted of keeping the young for about two weeks in pens 3 yards square, the bantam foster mother being confined in one corner, and later permitting the growing birds to range at will in cultivated fields. The system proved so successful that plans are now under way for further extension next year. Plots of rye, buckwheat and clover proved good feeding places for the young pheasants, and cultivated land in general was found to be far superior to uncultivated, as affording plenty of insect food and cover from hawks. We are rapidly coming to the conclusion that it is better to grow our own protective cover, such as alfalfa, wheat, rye, etc., rather than to rely on the natural cover of uncultivated land.

In spite of the late spring, with its necessarily increased amount of work, considerable land was sown with rye, millet and grass, while in preparation for next season's work extensive ploughing and planting was carried out. Large quantities of cabbages were raised to serve as green food for the birds during the winter. The cold wet spring and summer tested this as well as other stations in a manner which will seldom occur. Despite these conditions the output of birds was satisfactory.

During the year an addition to the wagon house for the storage of ice and a new large-sized incubator house have been built by employees at odd times.

Sutton Game Farm.

Operations have been carried on at this station as in former years in the rearing of pheasants and mallard ducks. Many of the old small coops for the latter have been discarded in favor of large rearing yards supplied with running water. The extension of this plan will do much toward improving the quality of the birds for liberation by developing their wild instincts, and will substantially decrease the labor entailed in caring for such a large number of coops.

While many young ducks were liberated this year a large number were kept to a mature size, in order to insure a good selection for brood stock. Pheasants were bred in small lots, 1 cock with 2 to 4 hens, for the most part in movable, covered pens instead of open runs, so that the birds could be kept with full wing, and many were liberated in season to enable them to raise a brood in the open after furnishing a good egg yield to the station.

Among the recent important improvements have been the erection of a shed with stalls and harness rooms for the storage of wagons, lumber and other material, and a line of permanent henhouses to replace the old portable coops. The superfluous shade trees, having become a severe handicap to proper bird rearing, for which only low brush is desirable, were removed during the winter. Nursery operations were continued, and quantities of trees and shrubs useful in bird rearing have been shipped to other stations.

Preparations are now well under way for the development of an elaborate educational exhibit illustrating the different phases of fish and game propagation. This is to be used in connection with live fish and bird exhibitions throughout the State.

East Sandwich Game Farm.

Activities at this station at the present time are being confined primarily to the rearing of quail, although we are continuing experimental work with the ruffed grouse.

The season of 1916 opened with more breeding quail on hand than ever before, in spite of the fact that vermin — mainly the great horned owl and the weasel — had done con-

Portable rearing crops and runs in a natural quail country at the East Sandwich Game Farm.

siderable damage. However, continuous adverse weather conditions during the first part of the summer proved a serious handicap to rearing, although late hatches were remarkable for the large percentage of young raised. We caution the public against assuming that the breeding of quail is as easy as that of pheasants. We believe that the time will come when a large number of these birds will be liberated annually, but we have yet much to learn in the control of vermin, which infest all our game farms, and the control of the young birds when they are ready to shift for themselves

In the case of grouse propagation progress is slow, but on the whole satisfactory. During 1915, 19 birds reared almost to maturity were liberated, thus conclusively proving that artificial rearing of grouse is no chimerical notion, though by reason of numerous natural peculiarities it is made difficult.

The region where these attempts at propagation are being conducted is admirably adapted for the life of the species. Intensive studies are being made of the habits of the birds, mating, etc., particularly with a view to determining the little individualities which now stand in the way of extensive rearing. Once these are ascertained, and the vermin of various kinds taken well in hand, appreciable results are expected. As was the case with quail, protracted periods of bad weather during the breeding season had drastic results upon the grouse.

We are carrying on experimental breeding of native black ducks and wood ducks at this station, the results of which will be more fully set forth in a later report.

Norfolk Game Farm.

The Norfolk Game Farm, established in 1912 through the co-operation of the Norfolk State Hospital and the Commissioners on Fisheries and Game, furnishes an excellent illustration of the utilization of undeveloped public lands. The game farm is situated upon 100 acres of land belonging to the hospital, where pheasants and mallard ducks are reared and liberated.

Reciprocity is the keynote. The State Hospital furnishes the land and the voluntary labor; the Commission supplies a novel means of occupational treatment for the patients, some

of whom are employed in caring for the birds, and given a chance for work in the open, which is so beneficial to physical and mental welfare. Since December, 1914, 168 patients from all parts of the State, representing 75 different professions, trades and occupations, have very cheerfully taken a keen interest in this work. The average stay of each patient is about six weeks, in which time a variety of knowledge pertaining to wild life can be obtained. When they return to their respective homes they are able to distribute at least a part of this knowledge, and thus stimulate interest of communities in fish and game conservation. This is the first practical test of utilizing State land in conjunction with another State Board, and we take this occasion to acknowledge the hearty and harmonious co-operation of the trustees of the Norfolk State Hospital and of the superintendent, Dr. Irwin W. Neff.

Fur-bearing Animals.

Within a few years it has been demonstrated that artificial propagation of fur-bearing animals for their pelts is a most lucrative industry. It is to be noted with regret that such activities are for the most part made conspicuous in Massachusetts by their absence. Recently, indeed, we have heard tales of the wonderful opportunities in rearing the silver black fox in Newfoundland and Prince Edward Island, and of the almost fabulous profits accruing to the pioneers in this work. Naturally we appreciate the fact that the raising of this animal is a condition subsequent only to an ideal state of affairs, and that the future success depends upon the market price. But why forget the species indigenous to this Commonwealth, the demand for which is growing steadily?

The Lowly Skunk.

Even the rearing of the lowly skunk has proved a source of good returns for the capital invested. As a matter of fact, the field in this part of the country has been so little exploited as to assure a prospective breeder a profitable business. The animal adapts itself readily to artificial rearing. By nature a scavenger, the expense of maintenance need not exceed a

matter of cents per head annually, and when full grown, if large, healthy and mostly black in color, they are marketable at a price which insures an excellent profit.

Muskrats.

Muskrats are the most prolific of our fur-bearing animals, producing an average litter of six. The value of their fur far outweighs any little damage they may cause, and they should be carefully protected.

Deer.

Deer are holding their own in all sections of the State. Numbers are annually killed by farmers, dogs and trains. The open season for hunting and the privilege of killing deer damaging crops have done much to bring about more amicable relations between hunters and farmers. Even the farmers are not slow when it comes to picking off deer damaging fruit orchards and saving ammunition at the same time, as, for instance, in the case of John Brown of Brimfield, who secured two deer at one shot.

The dog question is difficult to handle. It is especially difficult to keep hunting dogs always tied, and it is their natural instinct to seek out the woods. Nevertheless, owners of valuable hunting dogs should not allow them to run at large during the closed seasons, since it interferes with the breeding of ground-nesting birds and quadrupeds.

We appreciate the fact that in certain counties the logic of the case is that the deer must either be exterminated or so reduced as to no longer be a menace to the fruit-growing industry. It seems entirely possible for the State to support a large population of many kinds of birds and game and still not menace the landowner. With this in mind we should lend every assistance to the development of our agricultural activities. Withal there are thousands of acres of land whereon deer may thrive and afford sport and pleasure for generations to come.

LAW ENFORCEMENT.

The American public is slowly awakening to the fact that under present conditions the wild life of our forests will soon become extinct unless protected by laws which are supported by public sentiment. Even from a selfish standpoint we cannot permit the destruction of our wonderful wild life without suffering a loss which cannot be repaired. The enforcement of practical legislation is necessary for the propagation and protection of our wild birds and animals. Give your support and encouragement to the game wardens so that they can carry on without being handicapped this important work.

The enforcement of the laws is administered by a chief deputy, twenty-eight district deputies and a variable number of special deputies. In addition, town deputies and unpaid wardens assist in the work. The members of our deputy corps are energetic, upright men, influential in their respective communities, and capable of conducting their work quietly but with great efficiency. The position of a deputy is no sinecure. His duties do not end at any stated hour, but he must be on call day and night, alert to all that may transpire in his district of 415 square miles. In his difficult work the deputy needs the co-operation and not the opposition of each citizen. Let all true sportsmen further the work of preserving the fish and game by aiding our deputies in every possible manner in the performance of their duties. If at any time you may feel provoked by some fanciful wrong or activity of a deputy, remember that his life is dedicated to protecting and improving your sport. He is under civil service, and should be swayed by no consideration other than to do his best. He needs your co-operation. You and the future of your sport need him. He is humane and will welcome your suggestions and support. Look up the man in your district. Get acquainted with him, size him up, and we believe you will receive an impression worth while.

Combination Hunting and Fishing License.

The present tendency seems to favor charging both residents and nonresidents a reasonable fee for the privilege of fishing as well as hunting, thus requiring those who enjoy the sport of angling to contribute their share toward the expense of stocking and patroling the streams. Heretofore this expense has been met in part by receipts from hunting licenses, but such a policy is distinctly unfair to the gunner, in that it compels him to carry the additional burden of stocking streams for which the fishermen contribute nothing. If the hunter is taxed for his sport it is no more than fair that the fisherman should contribute something for his pleasure. To offset such objection the combination licenses which are now used in an increasing number of States should be adopted in Massachusetts.

Very often we hear that the proceeds of the hunting and prospective fishing licenses should be turned over to the State for the use of the Commission. While we appreciate this spirit we find that we should point out the advisability of acting in accordance with the budget system under which the finances of the Commonwealth are administered.

Report of Chief Deputy.

The condensed report of Chief Deputy Orrin C. Bourne, concerning the activities of his department during the past year, follows: —

Boston, Mass., Dec. 1, 1916.

Commissioners on Fisheries and Game, State House, Boston, Mass.

Gentlemen: — I herewith submit my summarized report for the year ending Dec. 1, 1916: —

The greater portion of my time during the past three years has been devoted to the office work necessary to direct the activities of the deputies, investigations of special complaints of law infraction, superintending the distribution of fish, and handling the large amount of correspondence directly relating to the enforcement of fish and game laws.

The work of our department has been greatly hampered by the excessively complicated, and indeed often conflicting, statutory provisions relative to fish and game, which has seriously impaired the efficiency of these laws and hindered their enforcement. These defects, and the difficulties thus imposed, may best be remedied by a complete codification of our present fish and game laws.

Enforcement.

The enforcement of the Fish and Game Laws has always been an uphill struggle, ever since the first was enacted in 1641. That section of the old beach law, which said that fishing and fowling should be free to all, has been well established in the public mind, but that part stating "unless otherwise ordered by the Legislature" has been easily forgotten or intentionally overlooked. In the early days the supply greatly exceeded the demand, but to-day a great and increasing population makes use of these assets, and exploits many natural supplies for commercial purposes. In spite of the valuable information which has been printed in conservation pamphlets, actual results have been much less than reasonably were expected. The cause is obviously due to carelessness upon the part of the general public, and to a blind faith that our natural resources can never be exhausted.

In most fish and game laws the prevailing idea has been to prevent the extinction of the natural supply. Opposition to these measures has arisen because certain persons had been in the habit of ruthlessly exploiting our natural resources, and, as is to be expected, such people have an innate grievance against protective laws. Indeed, it is difficult to impress many with the fact that by a little care and foresight in putting back undersized fish their catch will soon be worth at least three times as much, since they fear that someone else may get a share. Their motto seems to be, "Keep all you get, get all you can. Let future generations take care of themselves." Such people, for the welfare of the majority, must be restrained either by education or by force.

Migratory Bird Law.

The suspension of spring shooting through the two successive seasons of 1914 and 1915 has had a most beneficial effect on the birds. The Federal authorities claim, and reports from several parts of the State indicate, that last spring the birds were observed in greater numbers than for some years past. The United States government has received replies as to the effect of the Federal migratory bird law, which went into effect in 1913. Forty states report that an extraordinary increase in waterfowl has taken place during the short period the law has been in effect. The increase is commonly stated according to the locality to be from 10 to several hundred per cent., and includes such important species as mallards, black ducks, widgeon, blue-winged teal, green-winged teal, wood ducks, canvasbacks, Canada geese and swans, not to mention many other shore birds.

Federal Wardens.

Two hundred wardens have been appointed throughout the United States to serve under the Federal migratory bird law. These men receive no remuneration outside of a nominal sum of $1 per month, and their

Guns of various patterns confiscated from alien hunters under chapter 240 of the General Acts of 1915. Note especially in the center of the group the gun disguised as a cane.

duties consist chiefly in supplying the Biological Survey with information, field surveys, reports and investigations of law violations. The Federal wardens are not authorized to make arrests, and can only report violations.

In Massachusetts co-operation between the State government and the Federal government is assured by the fact that seven State fish and game deputies have received Federal appointments. Our deputies who have these appointments are as follows: —

Allan A. David, Taunton.
Jay Snell, Worcester.
Carl E. Grant, Gloucester.
Charles E. Tribou, Brockton.
Fred R. Ziegler, Pittsfield.
Frederick W. Goodwin, East Boston.
James F. Hatch, Springfield.

Confiscated Guns.

The alien law, chapter 240, General Acts of 1915, has well demonstrated its good qualities. Almost every court case has received a $50 fine and forfeiture of firearms. There is in storage at the State House a large number of guns and rifles of nondescript patterns and various makes ranging from a fine English shotgun listed when new at $90 to a little Hamilton 22. The majority are single barreled 12-gauge guns, and with some exceptions of a very poor quality. There is also a little double-barreled gun which the owner had just taken from the case. He was caught before he had a chance to use it.

The most interesting specimen is an apparently fine horn-handled cane. Push a brass brad below the crook and the handle pulls back, just below being a chamber for a 44-caliber cartridge or 20-gauge shotgun shell. Push back the handle and the hammerless gun is cocked. Pressure on another brass stud fires the weapon, the shaft of the cane serving as the barrel.

The typical alien offender when in danger of apprehension by our deputies throws away his gun or tries to conceal it in some place where he thinks it will not be found, and assumes an innocent expression. When questioned the usual response is "Me no understand." In several instances it has been necessary to secure a warrant and search premises and houses, often with good results in so far as effect upon others has been concerned, as word quickly passes around, and firearms are soon gotten rid of by other aliens in that locality.

We have no special grievance against the alien, either now or when the above statute was passed. Many of them develop into good citizens. But we feel that they should be held in check until they are willing to assume the obligations of citizenship, and have had an opportunity to adjust their ideas to a new condition.

Recommendations.

Fish Distribution. — Again the necessity of having additional men to aid in fish distribution is apparent, especially in view of the fact that this service occurs at the busiest time of the year as far as law enforcement is concerned. Men engaged in the work of fish distribution and fish salvage should be other than the regular district deputies.

During 1916 fish distribution has required the services of our regular district deputies to the following extent: —

(*a*) During May and June, the open season on trout, the entire time of six deputies for the distribution of trout fry and white perch.

(*b*) During July the entire services of three men in putting out yellow and pike perch, bass and bullheads were necessary, as well as the occasional assistance of others.

(*c*) During September and October, the most valuable time of the year as far as the law enforcement is concerned, the services of seven deputies were required for salmon and trout distribution, leaving the districts without patrol for weeks at a time.

The regular men should be continuously on duty in their districts, which, of course, would not necessarily prevent their meeting and properly handling all shipments. The new fish distribution men when not employed on fish work could be utilized as assistants to the district deputies.

They could also be used to good advantage in substituting them for the men assigned to regular districts, when they are absent from time to time. We are considering the advisability of temporary assignments of these men to new work for the value of experience. For example, let a man who has worked inland most of the time put in a month on the shore, etc.; also let each deputy spend a week or more each season at a bird farm or fish hatchery, in order to permit him to more fully understand the work. We expect our men to take an increasingly active part in our educational work as well as in constructive field work in their districts, and their sojourns at the stations will be a great help to them.

Exhibitions. — Two or three deputies on an average are taken from their regular work for the purpose of directing eight to ten educational exhibits and displays during September. Extra men should be employed for this work rather than so occupy the district deputies.

Power Boat. — The boat now owned by the Commission is quite inadequate to meet the demands of the present work. A semi-cruiser launch capable of 15 to 20 mile speed, with accommodations for two regular men and temporary sleeping berths for two more, could do much in checking violations along the coast, which is made impossible without such an accessory. It might also serve in the following respects, and, in fact, in other ways too numerous to mention: —

(1) The laws relative to the important lobster fishery of Massachusetts can be enforced only from the water.

(2) Egg lobsters could be readily purchased and distributed.

(3) The coast line from Newburyport to Westport could be satisfactorily covered in the enforcement of law.

(4) The smelt fishery in Boston Harbor could be protected.

(5) The laws relative to the torching and seining of alewives could be enforced.

(6) The taking of clams from polluted areas could more readily be stopped.

(7) Sunday hunting could be more easily regulated.

(8) The shooting of shore birds out of season would be more nearly impossible.

(9) The pursuit of wildfowl by aid of power boat could be more effectively controlled.

To enforce similar laws the State of New York, with less water front than Massachusetts, has four power boats available. Along our coast high power boats are used by the fishermen and duck hunters, yet at the present time our deputies must be content to put up with such makeshift crafts as they may hire on short notice. Practically it is impossible to rent a boat suitable for our work, as the owners say that they do not care to risk injury to boats and other property through retaliative acts of violators.

Automobile. — It has been amply demonstrated that a deputy with an automobile or motorcycle and side car can give a much wider and more careful patrol of his district than in any other manner. Our deputy service will soon prove inadequate and obsolete unless some measures are taken to enable it to compete with auto hunters. Already the automobile deputy is proving a successful and efficient feature in the enforcement of the fish and game laws in other States. The principal favorable features of automobile transportation for deputies are —

(1) Independence as far as railroad and trolley transportation are concerned.

(2) Immediate availability night or day to answer telephone complaints.

(3) A wider range of activity per diem.

(4) More frequent visits to remote parts of districts.

(5) Possibility of more quickly taking violators before the courts.

(6) Aid in corroborative evidence by having others accompany a deputy.

(7) Tremendous increase in the effectiveness of the deputies' work, previously limited to the ordinary means of travel. Autos are used very extensively by hunters, and our men, confined to ordinary means of travel, are easily left behind in any pursuit.

A combination of truck and delivery car would be an economical provision as well as of excellent service in transportation of cans of young fish across the city between the South and North stations. The present cost of such transportation is approximately $6 per load.

Unpaid Deputies and Town Wardens. — This service would be much

improved by requiring every applicant to take an examination as to his fitness and knowledge of fish and game laws. Town wardens should be subject to call duty either from headquarters or from the district deputy, and paid a reasonable sum and actual expenses for their time. Many towns and cities have not taken advantage of the opportunity of appointing wardens. If these officers could be appointed in each town and city, and work under the directions of our regular deputies, much good would result.

Deputy Equipment. — Deputies should be supplied with a proper form of official badge and the necessary "police goods" to facilitate law enforcement.

Legislation. — Laws relative to bringing game birds or animals into the State should be so modified as not to exceed the number or kinds which may be legally taken out. Possession of game for consumption only should be permitted for ten days after the close of the open season in State or county where taken, when kept in proper places outside of the large cold-storage plants, provided the owner has attached to said bird or animal or other game the regulation tag or mark.

Special efforts are being and will be made by the deputy force to apprehend persons or firms illegally dealing in game.

While the number of cases of damage to the property of landowners and of improper conduct on the part of thoughtless or vicious fishermen and hunters is growing less each year, we believe that there is plenty of room for improvement. Our intention is to instruct our deputies to assist wherever possible in collecting the evidence to convict all such violators, even though this work is not essentially a part of the enforcement of the fish and game laws. We hope that every such person will have to pay for all damage caused, and in aggravated cases that the offenders can be sent to jail.

We feel that in this effort we will have the support of every real hunter and fisherman in the Commonwealth. If they will reflect on the extent to which their favorite sport is circumscribed by posted lands and waters, all because of the depredations by a few, they will be ready to give us all information which comes to them on this subject. We shall treat it as absolutely confidential, and shall not ask the informant to appear in the case against his will.

Effective work will mean less posted land, a better feeling between the landowner and the sporting public, and a distinct advancement of the cause.

Orrin C. Bourne,
Chief Deputy.

MARINE FISHERIES.

Deep-sea Fisheries.

Prosperity ruled the waves for the salt-water fishermen of Massachusetts in 1916. Even the most grizzled "old timer" who is wont to lounge about the wharves and "gloom" each bright, present-day fishing success story with "That reminds me," and "Nuthin like in '78 when I," etc., was forced to admit, "I never see nuthin like it, no, sir."

For amount of fish landed in comparison with tonnage engaged, as well as for the enormous stocks and shares made by vessels, crews and fish-curing and shipping concerns generally 1916 will long be known as "the record year," unless old ocean should decide in this, or some other year to come, to just dump all at once her whole Klondike wealth of finny, swimming treasure on the decks of the fishing fleet.

The year of 1915 was an unusually successful one, but 1916 left it far out of sight to leeward. Every branch was prosperous; every branch produced financial returns seldom or never equaled. As a rule, in past years remarkably large stocks were the exception; in 1916 they were the rule, and the fishing vessels or firms that did not make money were the exceptions. The fleets of Gloucester, Boston and Provincetown all basked in the sunshine of this flood of fortune from the sea.

Mackerel. — The most gratifying feature of the whole year to fish dealers, vessel owners, skippers and fishermen alike was the influx of enormous schools of mackerel, which came early and stayed late. An unusually successful spring in southern waters, the fares being landed at Fulton Market, New York, was followed by a record late May and early June catch by our vessels on the "Cape Shore" trip to the Nova Scotia coast. After this the fish appeared off No Man's Land and Block Island, Marthas Vineyard and Nantucket; on Nantucket Shoals, or the "Rips;" in South Channel, on Georges Bank, along the Cape Cod Shore and Massachusetts Bay, hanging on in the two latter places until November, so it can be seen that

not only did Massachusetts crafts reap the greatest mackerel financial harvest ever known, but garnered the major portion of it right in "their own front yard."

Some idea of the magnitude of the value of this 1916 strike of mackerel can be gleaned from the fact that stocks of $25,000 and $30,000 were common for the six months' season (from $17,000 to $25,000 has often in years past carried off the high-line honor). Several vessels stocked from $30,000 to $40,000, quite a number from $40,000 to $50,000, several from $50,000 to $55,000 and one made the magnificent total of nearly $70,000.

The total mackerel catch of the New England fleet for 1916 (the fleet being practically all Massachusetts crafts) was 102,418 barrels fresh and 32,066 barrels salt. This catch was exceeded in several years in the palmy days of the 80's, when the fleet numbered from 300 to 400 sail, and included craft from practically every port in New England, but in point of "value received" the season of 1916 stands in a class by itself.

The high line of the fleet was schooner "Arthur James," Capt. John Matheson of Gloucester, whose stock for the season — practically seven months — was $69,592.89 gross, and on this each man of the crew shared $1,527 "clear of his living" aboard for that time. This stock is a record in the history of fishing, and has never been even approached by any sailing craft in any line of fishing in the New and probably in the Old World.

The stocks of some of the others of the mackerel seining fleet were as follows: —

Craft.	Captain.	Stock.
Schooner Monarch,	John F. Vautier,	$55,000
Schooner Marguerite Haskins,	Reuben Cameron,	53,000
Schooner Lottie S. Merchant,	Ralph Webber,	52,500
Schooner Ralph L. Hall,	Frank H. Hall,	43,500
Schooner Benj. A. Smith,	Martin L. Welsh,	43,000
Schooner Saladin,	Wallace Parsons,	40,000
Schooner Corsair,	George G. Hamor,	36,000

Craft.	Captain.	Stock.
Schooner Mary E. Harty,	Alonzo Smith,	$33,000
Schooner Victor,	Douglas McLain,	31,500
Steamer Lucia,	John S. Seavey,	30,000
Schooner Volant,	Wallace Walker,	30,000
Steamer Thelma,	Elroy Prior,	30,000
Schooner Harvard,	David Keating,	20,500
Schooner Agnes,	Ambrose Fleet,	26,500
Steamer Lois H. Corkhum,	Wm. Corkhum,	28,000
Schooner Constellation,	Chas. McGuire,	25,000
Schooner Evelyn M. Thompson,	James Ellis,	25,000
Schooner Kineo,	Norman A. Ross,	24,000
Steamer Bettina,	Wm. Ingraham,	24,000
Schooner Georgia,	Almon D. Malloch,	22,000

Ground Fish. — In the fleet which fished for codfish and other ground fish, hake, haddock, etc., all did well, both those which went for salt fares and those which carried both ice and salt for fresh and salt fish on the same trip. The crafts that fished fresh exclusively for the Boston market also had an unusually profitable year.

The halibut fleet was small, and the total catch not up to that of 1915, but the high prices which prevailed even through the summer months sufficed to make the year one of great profit for those engaged.

In the haddocking fleet some unusual stocks were made, and all previous high records were broken. Following are some of the choicest samples in the combined haddocking and "shack" fishery which go to make the year of 1916 most memorable in fishing history: —

Vessels.	Captain.	Stock.
Commonwealth,	Frank Watts,	$54,000 00
A. Piatt Andrew,	Wallace Bruce,	53,395 52
Frances S. Grueby,	Enos Nickerson,	52,125 00
Sylvania,	Jeffrey Thomas,	49,850 00
Arethusa,	Clayton Morrisey,	49,482 00

Vessels.	Captain.	Stock.
Pontiac,	Ernest Parsons,	$48,000 00
Valerie,	Frank Gaspe,	46,000 00
Progress,	Antonio Swazer,	44,000 00
Catherine,	Archie McLeod,	42,348 00
Morning Star,	Henry Ross,	42,036 00
Natalie Hammond,	Chas. Colson,	37,652 00
Ethel B. Penny,	Chas. Peterson,	37,000 00
W. M. Goodspeed,	George Perry,	37,000 00
Gladys & Nellie,	Michael Dewyer,	36,000 00
Eliz. W. Nunan,	Frank Nunan,	35,945 00

In most of the crafts cited above the crews shared from $1,000 to $1,400 "clear of their living" aboard for the year.

The high line of the swordfishing fleet also produced a record, the little schooner "Progress" of Edgartown, Capt. Robert Hackson, in eleven weeks, on five trips, in which she landed 438 fish, stocking $12,000, on which the crew shared $1,200 clear to a man.

Schooner "Hazel R. Hines," Capt. Fred Morrissey, was high line of the salt trawl bank codfishing fleet. She made two trips between spring and fall, weighing off 569,400 pounds of salt cod on which the record stock of $27,808 was made, the crew clearing $901.50 per man.

The banner single trip of the year was made by Capt. Alden Geele in schooner "Tattler," dory hand lining for salt cod. This craft, which sailed in April, was home late in August with 500,000 pounds of salt cod on which a stock of $21,000 was made, the crew sharing $533.32, also a record in this line of fishing.

In the fresh halibut fishery schooner "Robert and Richard," Capt. Robert Wharton, from Jan. 1, 1916, to Oct. 20, 1916, stocked $37,191.60.

In the early and later portions of the year quite a number of the fleet engaged in tilefishing, landing their fares fresh at Fulton Market, New York City. Their financial returns were good, and in some cases markedly so.

Boston Fish Market.

Progress is the keynote of the forty-second annual report of the Boston Fish Bureau, as presented by its able secretary, Mr. Frederick F. Dimick, which clearly and concisely presents the actual accomplishments of the salt-water fisheries during 1916, and indicates the future trend of the most important industry of this Commonwealth. We learn that active efforts are being made to popularize fish as a food with the public, and that in spite of the war the demand for this healthful, palatable, nutritious and cheap article of diet is regularly increasing. From the standpoint of efficiency and economy the dealers in fresh fish have banded together so that the fresh-fish business is now largely conducted by two corporations. In view of these two facts, with the increasing facilities for the catching, handling and distribution of fish now at hand, it is not unreasonable to predict a great future for the fish business.

During the past year 486 vessels comprised the fishing fleet which used the Boston market, — 5 steamer otter trawlers, 154 ground-fish vessels, 32 swordfish vessels, 85 mackerel and 200 other small craft.

Eat Fish. — "Eat Fish" is the salutary title of an interesting little pamphlet issued in 1916 by the New England Fish Exchange. The concise, convincing and logical manner in which the many advantages of a fish diet — healthful, gastronomic and economic — is set forth should do much toward popularizing this food. Of course, increased consumption of fish means more business for dealers, but it also means smaller bills for the careful housewife, to whom many valuable recipes for preparing savory and tempting sea foods are given. This book may be obtained free from the New England Fish Exchange, Boston, Mass. The following are a few pointers worthy of remembrance, which are set forth in this pamphlet: —

Fish should be fresh. If they are, the gills are red and the eyes bright and clear. If the flesh along the backbone is in good condition, it is a sign that the fish is fresh.

Fish should never stand in water.

Fish should never be fried in butter.

Plain boiled and mashed potatoes, squash and green peas go well with any kind of fish.

Cooked fish need never be wasted; it can be made into a stew or a delicious salad.

Remember, fish is made or marred in the cooking. With no other food can a good cook do so much.

The United States produces more fish and eats less than any seacoast nation.

With the most fertile fishing banks in the world lying but a few miles from its shores, the largest fish pier in the world, located at Boston, Mass., and one of the swiftest and most efficient transportation systems possible at its service, this country has not yet learned the lesson long since digested by Europe and Asia, — that by increasing its consumption of fish it will increase its general health and decrease the much-discussed "cost of living."

Fish received at Boston during the Year 1916.[1]

Varieties.	1916.		
	Domestic Ports.	Foreign Ports.	Grand Totals.
Salt, Smoked and Canned.			
Mackerel (barrels),	11,854	23,726	35,580
Codfish (quintals),	18,333	49,298	67,636
Herring (boxes),	739,374	2,348	741,722
Herring (barrels),	2,423	18,395	20,818
Bloaters (boxes),	175,873	50,643	226,516
Boneless (boxes),	–	36,413	36,413
Hake, haddock, cusk and pollock (quintals),	11,106	–	11,106
Sardines (boxes),	1,030,174	421	1,030,595
Lobsters (boxes) (canned),	–	21,269	21,269
Mackerel (boxes) (canned),	–	–	–
Clams (boxes) (canned),	25,085	–	25,085
Other salt fish (barrels),	6,760	8,651	15,411
Other salt fish (boxes),	26,817	42,057	68,874
Other salt fish (packages),	4,119	53,002	57,121
Fresh Fish.			
Mackerel (barrels),	87,940	7,337	95,277
Salmon (boxes),	–	3,994	3,994
Smelts (boxes) (frozen),	–	49,081	49,081
Herring (barrels) (frozen),	8,076	3,822	11,898
Squid (crates),	7,903	–	7,903
Swordfish (number),	8,624	1,503	10,127
Shad (barrels),	493	236	729
Other fresh fish (barrels),	55,482	1,381	56,863
Other fresh fish (boxes),	40,697	6,461	47,158
Shell Fish.			
Lobsters (packages),	3,841	32,678	36,519

[1] Compiled by the Boston Fish Bureau.

Gloucester Fish Market.

Among the successes of the banner year of 1916 for the Gloucester fisheries a particularly gratifying feature has been the great increase in the demand for the salt-fish products for which Gloucester has long been famous. So great and so insistent has been this demand during the past year that the entire home fishing fleet was absolutely unable to supply the necessary amount, and, in addition to the catch of the vessels of the New England fishing fleet, 28,353,748 pounds of "green" and cured fish, mostly cod, not the product of American fisheries, was obtained from Newfoundland, N. S., and the shores of Gaspé, Que. In addition to this large amount, which was all received by water, 21,000,000 pounds also were received by rail, largely from the Maritime Provinces.

The importance of salt fish as a good staple article of diet cannot be denied, and the future is bound to see an ever-increasing market as the public comes more and more to realize its food value. The reason for the excessive demand during the past year is perhaps due to certain underlying and contributing causes. Chief among these are the following: —

(1) The extensive advertising campaigns conducted by the various concerns which are placing salt fish on the market, resulting in broader field for its sale, — another instance of the triumph achieved by modern publicity methods.

(2) Hand in hand with the advertising goes the neat and attractive packages, prepared under sanitary conditions, which especially appeal to the fastidious housewife, and invariably prove good drawing cards.

(3) The labor-saving motto "no bones" likewise presents an attractive feature, and is an important factor in influencing the selection of a dish which can readily and easily be prepared.

(4) However, the present demand can largely be attributed to the simple fact that fish is cheaper than meat, and as a satisfactory substitute serves as a very effective weapon with which to combat our old arch enemy, the high cost of living. To all practical purposes it will continue of increasing service in the future.

New Crafts. — The following summary of shipbuilding opera-

tions in the Gloucester district for the year 1916 shows that 7 new fishing schooners have been completed and added to the fleet in addition to a number of gas screw steamers.

Following is a list of the vessels in 1916: —

Name.	Rig.	Tonnage.	
		Gross.	Net.
New.			
Henrietta,	Schooner,	99	62
Ruth and Margaret,	Schooner,	118	77
J. M. Marshall,	Schooner,	101	62
Elsie G. Silva,	Schooner,	104	59
Joseph P. Mesquita,	Schooner,	122	78
Olivette,	Schooner,	226	180
Nat. L. Gorton,	Schooner,	225	187
Olivia,	Gas screw,	22	12
Eliza I. Riggs,	Gas screw,	26	16
Bettina,	Gas screw,	120	66
Henry L. Marshall,	Gas screw,	78	42
Finback (yacht),	Gas screw,	159	122
Campechi (foreign),	Gas screw,	114	83
Lucia,	Gas screw,	95	43
Dorothy B.,	Gas screw,	20	9
Rebuilt.			
Robert and Edwin,	Steamer,	27	13
Rough Rider,	Gas screw,	15	9
Lorena,	Gas screw,	11	5
Quartette,	Gas screw,	15	5
Remeasured.[1]			
Minnie,	Gas screw,	–	–
Albertine,	Gas screw,	–	–
Rebuilt and changed.			
Herbert,	Barge,	114	91
Added from Other Ports.			
Eva and Mildred,	Gas screw,	46	43
Grace Otis,	Gas screw,	62	33
Georgia,	Gas screw,	105	62
Harmony,	Schooner,	119	80
Helen B. Thomas,	Gas screw,	78	45
Lena W.,	Gas screw,	16	6
Wish-ton-Wish,	Gas screw,	12	11

[1] Less than 5 tons.

Name.	Rig.	Tonnage.	
		Gross.	Net.
John J. Fallon,	Schooner,	125	77
James R. Clark,	Schooner,	70	43
James W. Parker,	Schooner,	132	96
James P. Foster, Jr.,	Schooner,	34	32
Squanto,	Gas screw,	133	81
Monarch,	Gas screw,	127	83
Elsie,	Schooner,	137	98
Lizzie Griffin,	Schooner,	107	71
Scout,	Gas screw,	15	12
Lost at Sea.			
Azorian,	Gas screw,	20	10
Charles A. Dyer,	Gas screw,	22	14
Dolphin,	Gas screw,	12	7
James A. Garfield,	Schooner,	73	50
Juno,	Schooner,	119	85
Oriole,	Schooner,	145	104
Premier,	Schooner,	123	89
Petrel,	Gas screw,	10	9
Corona,	Gas screw,	120	78
Marsala,	Schooner,	80	54
Carrie and Mildred,	Steam screw,	22	11

Stock of C. E. Trumbull abandoned.

List of Vessels sold from the Port of Gloucester Last Year.

Name.	Tonnage.	
	Gross.	Net.
Paragon (sold foreign),	115	80
Jorgina,	103	62
Harriett,	95	88
Conqueror,	139	95
Clintonia,	147	105
Mooanam,	117	72
Bohemia,	124	86
Titania (sold foreign),	106	77
Richard.	134	90

List of Vessels sold from the Port of Gloucester Last Year — Concluded.

Name.	Tonnage.	
	Gross.	Net.
Preceptor,	123	89
Monitor,	137	100
Frances P. Mesquita,	105	71
Hattie A. Heckman,	105	72
John Hays Hammond,	132	92
Lucinda I. Lowell,	110	77
Mary A. Gleason,	65	32
Emily Sears (gas screw),	44	22
Blanche F. Irving,	26	14
Etta B.,	13	11
Esther Gray,	30	14
Mary Emerson,	13	7
Swan,	13	8
William Keen,	–	–

Total Fish Receipts for Gloucester.

Pounds.

	1916.	1915.	1914.
Salt cod,	7,856,606	10,276,736	8,595,300
Fresh cod,	13,946,630	13,834,984	15,864,366
Halibut,	1,799,964	2,577,826	2,219,607
Haddock,	6,715,216	10,287,453	11,910,136
Hake,	2,976,489	5,221,969	5,960,968
Cusk,	1,589,252	2,979,625	3,129,570
Pollock,	10,424,632	8,925,399	9,032,819
Flitches,	89,702	268,366	332,117
Fresh fish from small boats,	8,500,000	2,500,000	–
Salt fish by rail,	21,000,000	8,725,842	–
Miscellaneous (unclassified),	600,000	500,000	–
Not product of American fisheries,	28,353,748	13,054,412	13,661,310

Total Fish Receipts for Gloucester — Concluded.

Barrels.

	1916.	1915.	1914.
Fresh mackerel,	6,621	12,409	3,184
Salt mackerel,	25,503	16,609	13,895
Fresh herring,	20,452	–	–
Fresh bluebacks,			
Fresh herring,	–	10,923	4,898
Fresh bluebacks,	–	6,202	–
Salt herring,	38,897	52,518	31,340
Frozen herring (pounds),	2,816,680	2,190,049	–
Cured fish (quintals),	63,560	69,339	31,180

Total receipts of fish at port of Gloucester for 1916, 132,852,572 pounds.

The Poor "Dog."

It is little wonder that the name of this poor denizen of the deep has had but little chance to grace the bill of fare of a three-penny lunch, much more the menu card of one of our select hostelries. Officials of the United States Bureau of Fisheries would have it that the well-known popular antipathy is only "name deep." According to statements made by them the title of the "critter" is its great handicap, but is that quite consistent? Is it not a fact that perfectly good membrane-covered horse meat, heated and wedged between two halves of a roll, is by popular acclaim given the *nom de plume* "hot dog"? Did not the article taste just as good to you on every occasion, Mr. Reader, whether you asked for a frankfort sandwich or for a plain, everyday "hot dog"? We have not noticed the difference. However, that is our only quarrel with the honorable projectors of the dogfish-consuming campaign. None of the other points they set forth are open to dispute. That the dogfish, beg pardon, grayfish (the suggested inoffensive way of saying dogfish in the future), is fully as tasty and nutritious as the majority of our "finny foods," and better in many respects than some, is an established fact. If the application of the name "grayfish" will help to overcome the foolish prejudice now so widespread, let it be grayfish.

As an example of the results of the work of the United States Bureau of Fisheries in metamorphosing its name and giving it the formal seal of approval, it is to be noted that the fish was brought into such popular favor that the demand quickly exceeded the supply, and winter found the dealers unable to supply the ever-increasing demand for grayfish, known to us all for years as dogfish.

The fish were put on the market canned, and the Massachusetts Fish and Game Commissioners can testify to its toothsomeness, both plain and in salad form. This coming season it is expected that many more crafts will engage in fishing for grayfish, and, as it can be marketed at a low price to the consumer, it is expected to soon take its place as a staple article of diet.

In 1915 we were introduced to tilefish which has become a favorite; in 1916 the grayfish was placed on the market with notable success. What will 1917 bring to us as a new fish food?

Lobster Fishery.

The Massachusetts lobster fishery has taken on a new lease of life as a result of the impetus given by the formation of lobster associations. The condition of these associations, composed of the lobster men in the various localities along the coast from Cape Ann to Plymouth, is a most flourishing one. The sentiment of the members is that the return of egg-bearing lobsters and "shorts" to their native waters, one of the principal objects of these associations, is proving of material advantage to the fishery.

Shellfish.

The oyster, quahaug, clam, scallop and other mollusks, popularly known as shellfish, form an important article of diet, providing good nutritive value with easy digestibility. We are pleased to note that the demand for shellfish is increasing, and that the popularity of the better-known species is spreading. Too few people are acquainted with the cheap, wholesome food which our shore fishermen provide. Not only eat fish, but also shellfish. The consumer will be well repaid and the fisherman likewise benefited by a broader market for his product.

Consumers, have your shellfish food shipped fresh to your homes. Do not be alarmed over the popular opinion that all shellfish are disease carriers. There is much less danger than the public believes, and the reputation of the poor oyster has been wrongly smirched for years. There is danger of disease from eating infected shellfish, but the sanitary conditions of modern marketing, and the restrictions on polluted waters at the present time, practically guarantee the purity of most Massachusetts shellfish. With shellfish as with milk there is always danger even under the most rigid inspection, but that danger is comparatively slight. The individual consumer may insure his health by buying fresh shellfish which come from grounds of known freedom from pollution, and by thorough cooking, except when eaten "on the half shell."

BIOLOGICAL INVESTIGATIONS.

The report of the biologist of the Commission, Dr. David L. Belding, follows: —

To the Commissioners on Fisheries and Game.

GENTLEMEN: — I herewith submit a résumé of the work of the biological department during the year 1916, and a summary of a special report upon the Massachusetts alewife fisheries.

Respectfully submitted,

DAVID L. BELDING, *Biologist.*

GENERAL REPORT.

Introduction. — An important factor in the growth and activities of a fish and game commission is the continual improvement of methods and the correct diagnosis of the problems intimately connected with the work. Results can only be accomplished by definitely planned experimental work, and it is this type of service which the biological department renders. In no other way except by actual experimental work can our Fish and Game Commission hold that reputation for progress which Massachusetts has always maintained in the past.

The investigations of the biological department have been conducted upon various phases of the fresh and salt water fisheries and upon problems of bird propagation, in addition to the organization of an educational bureau for the instruction of the public in matters pertaining to fish and game.

Laboratory. — Through the courtesy of Dr. Frank C. Richardson, director of the Evans Memorial Hospital, the biologist has been provided with excellent laboratory facilities for conducting experimental work. The Commission desires to express to Dr. Richardson its appreciation for the privileges thus afforded.

Assistants. — One assistant, Mr. Leslie J. Gilbride, has been associated with the biologist during the past year, and has proved of special service in handling routine correspondence, in extending the educational work and in the preparation of reports.

Pathological Examinations. — From all parts of the State birds and fish are sent, either by individuals or through the district

deputies, in order that the biologist may determine the cause of death or the prevailing disease. Any inhabitant of the Commonwealth may obtain pathological examinations of fish and birds free of charge by sending the specimens to Dr. David L. Belding, 80 East Concord Street, Boston, Mass., or to the office of the Fish and Game Commission, Room 321, State House. A letter containing the necessary information relative to the case should accompany each specimen.

Information Bureau. — Considerable time is given to answering the numerous and varied requests for information concerning fish and game and the fishing industries. Many of these questions cannot be answered off hand, and necessitate lengthy searching through records before the desired information can be obtained.

Special Investigations. — From time to time occasions require special investigations relative to problems, biological or otherwise, which suddenly arise at the fish hatcheries, the bird farms or in the salt-water fisheries. This type requires the biologist to visit various parts of the State for brief periods in order to study and report upon the conditions.

Educational Work. — During the past year special attention has been given to the education of the public in the interests of the fish and game protection. Plans for a quarterly bulletin which will deal in a popular manner with fish and game life have been perfected, and legislative enactment is alone necessary to permit the publication of a work which has already been wonderfully successful in other States; also, provisions have been made to distribute correct information at stated times to the press, magazines and fish and game associations.

In 1916 special pamphlets containing directions for the propagation of quail and mallard ducks were provided for distribution.

Reports of Investigations. — During the past year there have been published the following reports dealing with the investigations of the biological department: —

(1) A report upon the life history, growth and culture of the soft clam (*Mya arenaria*).

(2) A preliminary study of the otter trawl fishery.

(3) A report upon the fisheries of Buzzards Bay, presenting various information concerning methods of increasing the supply of food fish, with special emphasis on trap fishing.

The following reports are now in process of completion, and require only the suitable opportunity for publication: —

(1) The food of the economic lamellibranchiate mollusks, including a brief study of the value of certain Massachusetts waters for the production of shellfish.

(2) A shellfish compend, which gives briefly the practical problems of quahaug, clam, scallop and oyster culture.

(3) A general treatise on the diseases of game birds, including observations upon various types of infection on game farms.

(4) The fresh-water ponds of Massachusetts, their natural conditions for the sustenance of fish life, their possibilities of development, and their adaptability for stocking with food and game fish.

(5) The trout brooks of Massachusetts, including a brief description of the more important water systems of the Commonwealth, with a plan for the systematic stocking and development of their latent possibilities for food production.

(6) The Massachusetts alewife fisheries, their decline, present condition and a proposed plan for the re-establishment of the same, such as is outlined in the following pages.

Bird Diseases. — The study of certain bird diseases which have proved a menace at the State game farms has been continued and the preliminary investigations have been further extended particularly in respect to avian tuberculosis. There is urgent need for this type of work, since the future success of State and private game farms depends upon the elimination and prevention of destructive bird diseases.

Inland Waters. — Additions have been continually made to the systematic survey of the inland waters, both ponds and streams, which was begun in 1911. During 1911 and 1912 the majority of the State ponds were examined by members of the biological staff in respect to their natural conditions and qualifications for fish production. In 1914 the work was further extended to the streams, which were classified as suitable or unsuitable for stocking with trout or other fish. During the past year our records have been enlarged by the addition of new streams and ponds and by further facts concerning those already examined. In Massachusetts there are a large number of excellent fishing ponds of artificial construction, which do not come within the legal definition of State ponds, but on which the public is allowed to fish by the owners. Plans are under way for the investigation of this class of ponds, since they afford a good field for stocking, provided that the written consent of the owner of the pond to permit the public to fish thereon is given.

Buzzards Bay Fisheries. — The investigation of the fisheries of Buzzards Bay, which was begun in 1913 according to chapter 104 of the Acts of that year, was continued during 1916. A statistical study was made of the quantities and species of edible and non-edible fish, and the general effect of the present restrictive laws in respect to the taking of these fish. The results of this investigation are to be presented as House No. 534.

THE ALEWIFE FISHERIES OF MASSACHUSETTS.

Introduction. — An important duty of a progressive fish and game commission is the systematic investigation of our natural resources for the purpose of determining effective methods of conserving these valuable assets for the benefit of the public. The present condition of the alewife fisheries of Massachusetts presents a serious problem worthy of the most extensive study. In the following pages a summary of the results of a biological investigation of the alewife streams, to be published later as a complete report, is presented.

Importance. — Along the Atlantic coast the alewife or branch herring (*Pomolobus pseudo harengus*) is considered the most valuable river fish next to the shad, and in Massachusetts it is of greater commercial importance owing to the present scarcity of the latter. Ever since the landing of the Pilgrims the alewife has been closely related to the progress or poverty of the shore towns. In colonial records mention is made that the alewife provided food for the first inhabitants of New England. In each town the fishery was early made a public asset, and was held in common for the inhabitants. Indeed, the fisheries have been for years a source of no mean cash value to the shore towns.

The alewife is valuable for the following reasons: —

(1) As a *food*, either fresh or cured, despite the numerous bones, it forms an excellent and staple article of diet.

(2) As a *bait* it is most satisfactory for the line fishermen, and is available at certain seasons fresh, and at all times salted.

(3) The alewife not only supplied the early inhabitants with food and fertilizer, but also proved of greater value in attracting the schools of large fish, such as pollock, bluefish, mackerel and other predaceous food fish, to the Massachusetts coast. With the decline of the alewife fisheries there has been a corresponding decrease in the entire shore fisheries, which indicates that the success of our fishing communities in considerable measure is

dependent upon the condition of the alewife fisheries. The young in the fresh-water ponds, the spawning ground of the adults, are a valuable food for fresh-water fish such as bass, trout, pickerel, etc., and later, when they descend to the ocean in the fall, form an attractive bait for the larger salt-water species frequenting the coastal waters.

Results of Investigation. — The results of our investigation have shown that —

(1) The alewife fisheries of Massachusetts are in a precarious condition.

(2) The shad fisheries are practically exterminated.

(3) The present methods of operating the fisheries in many instances are inadequate.

(4) The causes of the decline can be largely eliminated by careful regulation.

(5) The alewife fisheries under proper control are capable of extensive development.

(6) There is a distinct need of uniform laws governing the management and operation of these fisheries, which can be readily and easily enforced.

Methods of Investigation. — The work consisted of three parts: (1) a survey or personal examination of every alewife stream; (2) a study of the fishing methods; and (3) a collection of statistics, past and present, for each fishery. The survey comprised a biological examination of each stream, with descriptions, maps, drawings and photographs, special emphasis being placed upon the spawning grounds, location of dams and fishways and sources of pollution. The various methods of fishing were studied in respect to their efficiency and as to their general effect upon each particular alewife stream. Statistics were compiled from town documents, special reports, legislative documents, private records and from other available sources.

Natural History. — The alewife is found along the Atlantic coast from the Gulf of St. Lawrence to Cape May. In Massachusetts practically all of the rivers and streams emptying into the ocean were formerly frequented by this fish, but of late years owing to the intervention of man, the alewife has been almost exterminated in many localities.

During the spawning season in March and April the alewife ascends the coastal streams to the fresh-water ponds to deposit its spawn, and returns in May to the ocean. The eggs are non-floating, and adhere in masses to stones, stakes and other sub-

stances under the water. In passing up the streams the alewives are able to surmount falls and dams not over 2 to 2½ feet high. In Massachusetts two classes of spawning ponds are found: (1) at the source of the coastal stream varying from a fraction of a mile to many miles from the ocean, and (2) near the salt water, usually separated only by a narrow sand beach through which a temporary inlet is made at times.

The young alewife attains a size of from 2 to 4 inches by fall, when it descends from the breeding grounds to the ocean unless prevented by artificial obstructions. Its subsequent growth is somewhat a matter of conjecture. It is commonly recognized that the same alewife will return three or four years later as a full-grown fish to the same stream for the purpose of spawning. This is what is known as "the parent stream theory," and in all probability it is correct, although positive proof is difficult to obtain. Upon this assumption are based the plans for the future re-establishment of the alewife fishery, since by placing the spawning adult in the headwaters of the depleted alewife streams the fishery can once more be re-established.

Present Conditions. — The present status of the alewife fishery is deplorable. This condition has primarily resulted from the lethargy of the towns, which, by inactivity, carelessness or ignorance, have permitted the destruction of this valuable fishery. Certain towns have taken an active interest in the welfare of their alewife fishery, and have maintained the streams in first-class order, a marked contrast to the wretched conditions generally prevalent in other coastal towns. It is imperative that if this State asset is to be saved, radical and immediate action must be taken to rouse the inattentive towns to a sense of their responsibility.

Decline. — The decline of the alewife fisheries is an established fact recognized by all. There is scarcely a stream in the Commonwealth with a maximum normal production, and the greater part are yielding an infinitesimally small percentage of this amount. On the other hand, the underlying causes of the decline are not as well known, but are of great importance as regards the future of the alewife fishery.

(1) *Natural Changes.* — Deforestation reduces the volume of water. Changes in the outlet of the streams or in the water level or outlet of the ponds which form their source are likewise contributing factors.

(2) *Obstructions.* — The accumulation of débris and other ma-

terial, particularly in the smaller streams or near the source of the larger, interferes with the passage of the alewives.

(3) *Dams.* — Obstruction to the streams by dams is the most important factor in preventing the passage of fish to the spawning grounds. Dams alone are not particularly dangerous. Dams without suitable fishways to enable the proper passage of fish are pernicious. In all our alewife streams the old laws explicitly state that satisfactory passageways for fish should be made over all dams, but, in spite of the enactment and good intent of these old laws, they were either evaded or defied by the mill owners, with the result that there are many dams without suitably equipped fishways which have proved a serious menace to the alewife fisheries. Efforts are now under way for the installation of suitable fishways in the alewife streams.

(4) *Cranberry Bogs.* — Cranberry interests unless conducted with care conflict with the alewife fisheries. In southern Massachusetts the development of cranberry bogs along the alewife streams, with the frequent dams and obstructions, has proved a serious drawback to the success of the alewife fishery, as the cranberry industry has been considered of more value than the fishery by the towns, and the owners have not been required to provide suitable passageways for the fish. The profits of the cranberry bogs are usually sufficient to warrant a reasonable outlay in maintaining the rights of the fisheries.

(5) *Water Supplies.* — The taking of ponds at the source of the alewife streams for local water supplies has decreased the area of spawning ground.

(6) *Pollution.* — The pollution of the streams from manufacturing sources has likewise proved detrimental to the life and passage of the fish, and many streams have been temporarily ruined by the chemical and other injurious substances which have been turned into the water.

(7) *Overfishing.* — The immediate cause of the decline in the alewife fisheries has been overfishing, whereby too many alewives were taken and too few allowed to pass to the spawning grounds. This condition has been brought about by unenforced laws and ineffectual local regulation as to the times and methods of fishing. In particular, the short-term lease, frequently for one year, has proved a serious menace by putting a premium upon the lessee's getting all he could out of the fishery for the year without considering its future welfare.

Restoration. — To save the Massachusetts alewife fisheries and insure their future immediate and effective action is necessary.

The Commissioners on Fisheries and Game are already engaged upon the following practical plans for the development of the individual streams: —

(1) Divide the old alewife streams into two classes, — (*a*) those capable of restoration, and (*b*) those in which the fishery may never or may with difficulty be restored. First give attention to selected streams of the former class.

(2) Form a clear passageway for the fish to and from the spawning grounds. Such work entails the installation of workable fishways and screens, and the clearing out of all obstructing material.

(3) See that the owners of cranberry bogs co-operate in the protection of the fisheries, and that due care is used to prevent the damage which frequently results under present conditions.

(4) Restock depleted streams by transplanting spawning alewives to their headwaters.

(5) Protect certain streams by well-regulated closed seasons.

Even more important is the reorganization of the methods of operating the fisheries, which must be simultaneously enforced in order to receive any benefit from the above plan of improving the streams. The method of operating the fisheries by the town is perhaps the main reason for their present deplorable condition. State control would eliminate many evils, and in the long run would doubtless prove the best measure. However, the system of town control has been in vogue for so long, and in a few instances has proved so thoroughly efficient, that it is suggested the individual towns be given a chance to prove their ability to properly manage their alewife fisheries by adopting the following recommendations: —

(1) Establish uniform alewife laws for all the shore towns of the Commonwealth, repealing the special acts for the various localities. These laws should be simple and broad enough to permit individual town regulation of certain local needs.

(2) Do not have over three fishing days per week, and make these the same for the whole State.

(3) Enact closed seasons at definite intervals.

(4) When a fishery is sold by the town, require a lease for a period of not less than five years.

(5) Institute uniform methods of sale and catching.

(6) Maintain rigid inspection to prevent illegal pollution, obstruction and overfishing.

(7) In addition to advisory powers give the State the right to force negligent towns to properly take care of their fisheries.

STATISTICS.

Itemized List of Moneys received by the Commissioners on Fisheries and Game during the Fiscal Year 1916, and paid into the Treasury of the Commonwealth.

Received for —	Amount.
Nonresident hunters' licenses at $10,	$1,591 10
Nonresident hunters' licenses at $1,	194 55
Resident hunters' licenses at $1,	59,242 35
Alien hunters' licenses at $15,	1,193 25
Game tags,	386 70
Forfeited pike perch,	271 25
Sales of fish from Buzzards Bay,	343 60
Interest on deposits,	107 27
Sales of produce, Wilbraham Game Farm,	558 13
Sales of produce, Sutton Hatchery,	777 78
Sales of produce, Sharon (discontinued; apparatus sold),	25 00
Sale of produce, East Sandwich Bird Farm,	22 21
Sale of produce, Marthas Vineyard Reservation,	235 08
Sales of materials, Sandwich Hatchery,	29 84
Sale of standing grass, Palmer Hatchery,	12 00
Sales of geese, Marshfield Bird Farm,	335 00
Total,	$65,325 11

Disbursements for 1916.

Compensation of Commissioners,	$5,659 16
Clerical services,	5,299 03
Expenses,	7,066 33
Ponds (section 19, chapter 91, Revised Laws),	498 66
Continuation of investigation of Buzzards Bay,	7 88
Land for hatcheries (chapter 135, Resolves of 1915),	37 00
Exhibitions and general publicity,	1,001 31
Barn at Wilbraham Game Farm (chapter 154, Resolves of 1916),	14 05
Shed for horse at Sutton Hatchery (chapter 154, Resolves of 1916),	296 97
Six new cement pools at Sandwich (chapter 154, Resolves of 1916),	1,584 35
Repairing meat house, Sandwich (chapter 154, Resolves of 1916),	250 00

Enforcement of the laws, including salaries and operating expenses of the deputies,	$52,409 68
Propagation of game birds, animals and food fish, including purchase of egg-lobsters, maintenance of game farms and hatcheries, and propagation of wild birds and quadrupeds,	57,078 68
Establishment of fish hatcheries,	6,189 34
Establishment of fish hatcheries (shad) (chapter 115, Resolves of 1915),	1 58
Total,	$137,394 02

Hunting Licenses.

Class.	Number.	Amount.
Resident, at $1,	64,901	$59,242 35
Nonresident, at $1,	225	194 55
Nonresident, at $10,	161	1,591 10
Alien, at $15,	80	1,193 25
Totals,	65,367	$62,221 25

Classified Court Records, 1916.

Violation.	Fines. Imposed.	Fines. Paid.	Costs of Court.	Disposition of Case. Discharged.	Convicted.	Appealed.	Filed.	Number of Cases.
Bass: —								
Short bass,	$14	$14	–	–	2	–	–	2
Possession in closed season,	19	19	–	–	5	–	1	5
Perch: —								
Spearing,	10	10	–	–	2	–	–	2
Short perch,	8	8	–	–	7	–	3	7
Trout: —								
Possession in closed season,	10	10	–	–	1	–	–	1
Short trout,	217	217	–	–	17	–	2	17
Clams: —								
Taking without permit,	165	45	$10 00	1	11	5	2	12
Taking from contaminated water,	5	5	–	3	1	–	–	4
Lobsters: —								
Short lobsters,	872	385	–	1	31	3	1	32
Interference with traps,	–	–	–	1	1	–	1	2
Possession of egg-lobsters,	70	60	–	–	3	1	–	3
Taking from trap of another,	20	20	–	–	1	–	–	1
Taking before 1 year resident,	20	20	–	–	1	–	–	1
Deer: —								
Failure to report killing,	75	–	–	1	5	1	2	7
Illegal killing,	190	165	–	–	5	–	–	5
Having other than shotgun in open season,	25	25	–	–	1	–	1	1
Possession with intent to sell (flesh),	40	40	–	–	1	–	–	1
Owner of dog chasing deer,	30	30	–	–	3	–	–	3

Classified Court Records, 1916 — Continued.

Violation.	Fines.		Costs of Court.	Disposition of Case.				Number of Cases.
	Imposed.	Paid.		Discharged.	Convicted.	Appealed.	Filed.	
Ducks: —								
Killing out of season,	10	10	$5 70	–	5	–	2	5
Possession in closed season,	40	40	–	–	2	–	–	2
Partridge: —								
Selling unlawfully,	240	120	–	–	2	–	–	2
Buying unlawfully,	160	160	–	–	2	–	–	2
Having in closed season,	280	280	–	–	3	–	–	3
Pheasants: —								
Illegal killing,	70	60	5 00	1	5	–	2	8
Selling,	–	–	–	–	3	–	3	3
Wild birds, protected: —								
Taking,	30	30	–	–	2	–	–	2
Killing black-crowned night herons,	10	10	–	–	1	–	–	1
Killing Bonaparte gull,	10	10	–	–	1	–	–	1
Killing grebe,	10	10	–	–	1	–	–	1
Killing myrtle warbler,	10	10	–	–	1	–	–	1
Killing American bittern,	5	5	–	–	1	–	–	1
Trapping without permit: —								
Trapping without permit,	–	–	–	–	1	–	1	1
Trapping without owner's permit,	80	30	–	–	7	–	1	7
Having miscellaneous species in possession: —								
Robin,	50	40	–	–	4	–	–	4
Ferret,	10	10	–	–	1	–	–	1
Pickerel in closed season,	–	–	–	1	–	–	–	1
Coot in closed season,	20	20	–	–	1	–	–	1
Quail in closed season,	40	40	–	–	3	–	–	3
Rabbits in closed season,	30	28	2 10	1	7	–	2	8
Smelt in closed season,	85	60	–	–	4	–	–	4
Short pickerel,	18	18	–	–	9	–	2	9
Taking unlawfully: —								
Fish in closed pond,	10	10	–	–	2	–	–	2
Fish from pond of Fish and Game Commission,	–	–	–	–	1	–	–	1
Smelt (netting),	50	–	–	–	1	–	–	1
Seed scallops (2 *nolo*),	75	25	–	–	7	2	3	9
Quahaugs without permit,	10	10	–	–	2	–	–	2
Gray squirrels in closed season,	–	–	–	–	1	–	1	1
Fish with a seine,	205	205	–	–	9	–	–	8
Fresh-water fish by other than hook and line,	155	155	–	–	10	–	–	10
Mackerel under ¼ pound with seine,	75	75	–	–	3	–	–	3
Scallops, more than 10 bushels in one day,	30	30	–	–	3	–	–	3
Shellfish from waters of Mashpee,	50	50	–	–	1	–	–	1
Other miscellaneous offences: —								
Violation of alien law,	1,400	1,300	–	–	36	1	8	40
Assault on officer,	90	35	–	–	4	1	–	4
Hunting without license,	353	308	6 90	5	51	–	14	56
Hunting on posted land,	115	105	11 40	–	15	1	1	15
Sunday hunting,	270	240	4 00	3	38	1	8	42
Setting snares,	255	180	–	–	9	–	1	9
Using trawl in pond,	90	90	–	–	4	–	–	4
Using fish trap in fresh water,	15	10	–	–	2	–	–	2
Hunting on State reservation,	16	16	–	–	5	–	3	6
Hunting from moving motor boat,	15	–	–	–	4	–	3	4
Pulling down stone wall,	–	–	–	–	3	–	3	3
Hunting from automobile,	15	15	–	–	1	–	–	1
Disturbing growth of planted oysters,	5	5	–	–	1	–	–	1

Classified Court Records, 1916 — Concluded.

Violation.	Fines.		Costs of Court.	Disposition of Case.				Number of Cases.
	Imposed.	Paid.		Discharged.	Convicted.	Appealed.	Filed.	
Other miscellaneous offences — *Con.*								
Failure to visit fish traps once in twenty-four hours,	40	20	–	–	2	–	–	2
Using choke trap with opening more than 6 inches,	75	–	–	–	1	–	–	1
Refusing to produce hunting license,	–	–	–	2	–	–	–	2
Using seine in Weymouth Bay,	300	–	–	–	4	4	–	4
Fishing for shiners with net exceeding 36 square feet,	60	40	$5 60	–	3	–	–	3
Dealing in partridges, quail, geese and black ducks,	–	–	–	–	1	–	–	1

Summary.

Number of cases,	408
Fines imposed,	$6,772 00
Fines paid,	$4,988 00
Costs of court,	$47 70
Cases discharged,	20
Cases convicted,	388
Cases appealed,	20
Cases filed,	71
Number of laws violated,	72

Deputy Fish and Game Commissioners with their District Numbers, Residences and Telephone Numbers.

District Number.	Name.	Residence.	Telephone Number.
1	William H. Jones,	Nantucket,	791
2	Allan Keniston,	Edgartown,	6-2
3	Everett B. Mecarta,	Harwich,	36
4	Samuel J. Lowe,	New Bedford,	1153
5	Allan A. David,	Taunton,	966
6	Nathan W. Pratt,	Middleborough,	194-X
7, 8	Charles E. Tribou,	Brockton,	2101
9	William H. Leonard,	East Foxborough,	Foxborough 85-3
10	James E. Bemis,	South Framingham,	564-M
11	Orrin C. Bourne,	Melrose,	524-W
11	Frederick W. Goodwin,	East Boston,	515-2
12	Carl E. Grant,	Gloucester,	1323-M
13	Walter A. Larkin,	Andover,	408
13	George W. Piper,	Andover,	471
14, 15	Thomas L. Burney,	Lynn,	4565
16	E. A. Macker,	North Grafton,	60
17	Jay Snell,	Worcester,	Cedar 442-M
18	Irving O. Converse,	Fitchburg,	1930
19	Albert L. Stratton,	Gardner,	543
20	Dennis F. Shea,	Ware,	132
21	John F. Luman,	Palmer,	136
22	James P. Hatch,	Springfield,	5582
23	Peter P. Monahan,	Westfield,	710
24	P. F. McCarthy,	Easthampton,	109
25	Lyman E. Ruberg,	Greenfield,	585
26	Arthur M. Nichols,	North Adams,	537
27	Fred R. Ziegler,	Pittsfield,	42
28	William W. Sargood,	Lee,	205-3

Orrin C. Bourne, chief deputy, Room 321, State House; telephone, Haymarket 4600; residence telephone, Melrose 524-W.

Town Fish and Game Wardens.

Name.	Town.	County.
Basil E. Aldrich,	Milford,	Worcester.
James S. Anthony,	Carlisle,	Middlesex.
G. Hurll Beers,	Amesbury,	Essex.
William E. Briggs,	Tewksbury,	Middlesex.
John J. Butler,	Salem,	Essex.
Cornelius J. Callahan,	Canton,	Norfolk.
Arthur G. Chickering,	Lancaster,	Worcester.
Lawrence Clement,	Becket,	Berkshire.
Watson T. Cobb,	Rochester,	Plymouth.
Joseph Craig,	Clinton,	Worcester.
William F. DeMeritt,	Dover,	Norfolk.
Bartholomew J. Dowling,	Groton,	Middlesex.
G. Louis Hathaway,	Middleborough,	Plymouth.
Ralph W. Hill,	Webster,	Worcester.
Elmer H. Houghton,	Lowell,	Middlesex.
Claude E. Hume,	Dalton,	Berkshire.
Harry H. Jacobs,	Concord,	Middlesex.
Isaac M. Loring,	Plympton,	Plymouth.
John McFarlane,	Methuen,	Essex.
Patrick J. McIntire,	Brimfield,	Hampden.
James A. Peck,	West Chelmsford,	Middlesex.
L. L. Phinney,	Whitman,	Plymouth.
Charles W. Prescott,	Concord,	Middlesex.
Charles G. Robinson,	Needham,	Norfolk.
Harold Royle,	Waltham,	Middlesex.
John F. Smith,	Cohasset,	Norfolk.
W. Perry Tarleton,	West Newbury,	Essex.
William J. Tedford,	Lancaster,	Worcester.
Samuel D. Thurston,	Rockport,	Essex.
Joseph Wall,	Westford,	Middlesex.
Gerry E. Wells,	Leominster,	Worcester.
J. Fred Wellsman,	Belmont,	Middlesex.
Bartlett H. Wright,	Falmouth,	Barnstable.

Statistical Returns of Shore Fishermen.

Fish.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Alewives,	486,467	621,113	1,276,132	1,207,505	1,452,809	1,481,860	1,076,462	594,045	653,058	312,324	291,591
Bluefish,	42,536	11,308	30,396	50,767	25,390	95,485	29,066	17,034	17,551	12,253	11,076½
Flounders,	812,398	922,534	667,928	1,181,240	1,294,868	1,265,901	1,375,749	181,996	1,027,205	968,801	1,393,871½
Mackerel,	1,219,021	816,915	302,109	593,263	320,066	738,558	1,064,806	727,468	1,295,320	1,341,021	1,077,719
Menhaden,	19,425	3,525	300	18,340	277,087	334,216	264,740	5,301	133,403	–	2,600
Pollock,	1,645,567	1,745,313	774,702	797,281	1,332,572	869,079	149,885	151,866	285,899	132,825	183,358
Salmon,	144	15	23	–	–	9	9	–	–	–	8
Scup,	257,383	420,043	314,188	99,290	215,816	121,380	156,633	166,170	111,069	134,058	49,360
Sea bass,	20,095	14,725	12,827	81,751	5,557	20,286	56,530	253,864	11,197	61,295	10,980
Sea herring,	3,075,520	2,167,683	2,619,451	2,944,755	1,394,289	3,367,020	1,887,272	1,879,021	1,775,877	1,098,455	1,043,887
Shad,	50,686	97,410	49,594	25,350	95,707	60,772	185,321	7,006	8,118	4,058	17,728
Squeteague,	2,027,361	2,121,112	394,904	240,058	184,355	151,603	73,236	23,585	7,128	3,187	15,901
Striped bass,	4,605	41,422	42	1,788	304	177	455	822	50	201	95
Squid,	408,555	929,290	1,873,078	2,885,433	1,471,775	1,384,721	1,181,829	627,319	467,125	361,393	356,697
Tautog,	12,564	33,600	12,298	12,786	24,368	17,376	16,396	20,109	31,893	5,773	7,492
Other edible fish,	4,770,399	3,822,704	3,999,400	3,053,198	3,065,086	4,170,323	2,207,033	1,985,991	3,703,524	1,630,744	1,314,991
Lobsters,	730,998	1,559,829	1,552,685	1,989,326	1,440,066	1,233,120	956,540	814,595	849,299	845,396	737,853
Total pounds,	15,583,727	15,328,291	13,880,057	15,182,231	12,600,115	15,011,886	10,697,182	8,156,252	10,377,716	6,911,784	6,499,298
Total value,	$253,683 44	$262,127 91	$166,121 86	$406,014 80	$342,466 32	$364,812 92	$295,297 70	$258,044 72	$300,674 54	$252,089 08	$260,283 10
Number of returns,	136	117	93	103	105	95	96	79	67	61	65
Number of men,	430	363	309	369	333	319	296	279	256	223	202
Number of boats,	372	325	280	319	289	277	275	240	227	207	144
Value of boats,	$69,400 50	$65,537 00	$53,328 00	$68,131 00	$64,544 00	$62,230 00	$67,773 00	$45,709 00	$49,904 00	$51,462 00	$34,839 00
Number of traps,	115	126	116	119	100	96	135	84	61	53	64
Value of traps,	$110,660 00	$96,385 00	$83,200 00	$80,750 00	$69,600 00	$64,375 00	$65,612 00	$58,900 00	$57,500 00	$33,200 00	$34,975 00
Number of nets,	1,641	1,212	975	1,306	1,283	1,184	1,065	816	837	704	586
Value of nets,	$19,591 50	$17,209 00	$16,162 00	$18,591 00	$20,794 50	$16,120 00	$17,725 00	$14,567 00	$14,329 00	$13,786 00	$9,778 35

Massachusetts Lobster Fishery.

Date.	Fishermen.	Traps.	Number of Lobsters above 10½ Inches.	Egg-bearing Lobsters.	Average Catch per Pot.	Ratio of Egg Lobsters to Total Catch.	Average Ratio of Egg Lobsters, Five-year Periods.	Average Catch per Trap, Five-year Periods.
1888,	367	21,418	1,740,850	–	81	–		
1889,	344	20,016	1,359,645	61,832	68	1: 21.90		
1890,	379	19,554	1,612,129	70,909	82	1: 22.70		
1891,	327	15,448	1,292,791	49,973	84	1: 25.80	1: 27.06	76.0
1892,	312	14,064	1,107,764	37,230	79	1: 29.75		
1893,	371	17,012	1,149,332	32,741	62	1: 35.10		
1894,	425	20,303	1,096,834	34,897	54	1: 31.14		
1895,	377	17,205	956,365	34,343	56	1: 27.80		
1896,	453	22,041	995,396	30,470	45	1: 32.60	1: 33.08	49.4
1897,	388	18,829	896,273	23,719	48	1: 37.70		
1898,	340	16,195	720,413	19,931	44	1: 36.10		
1899,	327	15,350	644,633	16,470	42	1: 39.10		
1900,	309	14,086	646,499	15,638	46	1: 41.30		
1901,	331	16,286	578,383	16,353	35	1: 35.30	1: 38.82	36.3
1902,	410	20,058	670,245	–	34	–		
1903,	300	20,121	665,466	–	33	–		
1904,	326	19,539	552,290	13,950	28	1: 39.60		
1905,	287	13,829	426,471	9,865	31	1: 43.20		
1906,	335	21,918	487,332	9,378	22	1: 52.00		
1907,	379	21,342	1,039,886[1]	10,348	49	1: 100.40	1: 84.68	40.2
1908,	349	19,294	1,035,123[1]	9,081	54	1: 114.00		
1909,	522	29,996	1,326,219[1]	11,656	45	1: 113.80		
1910,	390	26,760	935,356[1]	7,857	35	1: 68.10		
1911,	341	19,773	822,107[1]	5,488	42	1: 149.80		
1912,	291	16,665	631,595[1]	4,744	38	1: 133.10	1: 121.14	30.8
1913,	254	13,877	543,129[1]	3,408	39	1: 159.40		
1914,	310	16,128	566,191[1]	5,932	35	1: 95.40		
1915,	253	15,042	563,598[1]	5,050	37	1: 111.60	–	–
1916,	244	13,707	491,940[1]	4,918	36	1: 100.00	–	–

[1] Number of lobsters above 9 inches.

Fish Distribution

County.	Brook Trout.			Brown Trout.		Rainbow Trout (Fingerlings).	Chinook Salmon (Fingerlings).	Landlocked Salmon (Fingerlings).
	Fry.	Fingerlings.	Adults.	Fingerlings.	Adults.			
Barnstable,	–	10,000	1,350	–	–	–	10,000	7,200
Berkshire,	380,000	53,525	860	–	100	4,500	15,000	2,500
Bristol,	–	61,500	300	–	–	–	–	–
Dukes,	–	–	–	–	–	–	–	–
Essex,	10,000	96,500	650	–	–	–	300,000	7,200
Franklin,	55,000	46,355	200	–	–	3,000	–	–
Hampden,	80,000	49,000	1,650	2,500	–	3,400	15,000	–
Hampshire,	130,000	76,300	200	–	–	1,000	–	–
Middlesex,	210,000	67,575	1,050	–	–	–	–	–
Nantucket,	–	–	–	–	–	–	–	–
Norfolk,	20,000	14,000	500	–	–	–	–	–
Plymouth,	30,000	48,000	–	–	–	–	5,000	–
Suffolk,	–	–	–	–	90	–	–	–
Worcester,	625,000	134,200	45	–	–	–	26,000	2,500
Totals,	1,540,000	656,955	6,805	2,500	190	11,900	371,000	19,400

for Year 1916.

Small-mouth Black Bass.		Large-mouth Black Bass.		White Perch.	Yellow Perch (Fry).	Pike Perch (Fry).	Horned Pout.	Pickerel.	Landlocked Smelt.	
Fry.	Fingerlings.	Fry.	Fingerlings.						Eggs.	Adults.
–	4,800	14,000	500	1,680	3,600,000	160,000	–	–	9,000,000	3,000
90,000	14,000	–	–	5,480	2,000,000	3,200,000	36,000	–	–	–
–	2,100	–	–	4,160	350,000	400,000	5,400	–	–	–
–	9,000	–	3,000	–	–	960,000	–	–	–	–
–	–	–	–	3,360	–	1,040,000	8,000	–	14,000,000	–
–	–	26,000	–	3,520	2,000,000	800,000	3,600	–	–	–
16,000	3,000	–	–	3,840	3,275,000	2,120,000	13,000	–	–	8,200
–	7,000	–	–	1,000	375,000	400,000	2,000	–	–	–
–	6,900	4,000	–	6,840	1,000,000	1,400,000	3,000	–	2,000,000	4,000
–	–	–	–	–	–	–	–	–	–	–
–	–	10,000	–	1,680	–	360,000	1,350	–	–	–
–	–	4,000	–	–	–	1,040,000	350	–	7,000,000	4,000
–	–	–	–	–	–	–	–	–	–	–
16,000	12,000	5,000	–	22,100	4,200,000	2,760,000	24,200	200	2,000,000	7,200
122,000	58,800	63,000	3,500	53,660	16,800,000	14,640,000	96,900	200	34,000,000	26,400

Game Distribution for Year 1916.

County.	Pheasants.			Mallard Ducks.			Quail.		White Hares.
	Eggs.	Young.	Adult.	Eggs.	Young.	Adult.	Eggs.	Young.	
Barnstable,	13	64	8	12	60	24	–	35	9
Berkshire,	651	294	15	60	233	–	–	–	30
Bristol,	52	137	8	60	10	8	–	15	29
Dukes,	–	–	–	160	100	–	–	40	10
Essex,	166	188	46	60	56	16	72	95	–
Franklin,	119	173	15	12	24	–	15	–	20
Hampden,	1,157	212	8	192	108	–	–	10	20
Hampshire,	308	230	28	12	99	8	–	–	40
Middlesex,	96	141	60	36	135	8	60	24	28
Nantucket,	83	32	–	36	30	–	–	–	10
Norfolk,	181	108	31	75	38	12	45	10	10
Plymouth,	52	76	11	62	–	8	–	15	31
Suffolk,	82	–	–	48	8	–	–	–	–
Worcester,	610	492	8	184	366	36	45	20	58
Totals,	3,570	2,147	238	1,009	1,267	120	237	264	295

Statistics on Pheasants shot in Open Season of 1916.

County.	First Day of Open Season, October 12.		Second Day, October 13.		Entire Open Season, October 12 to November 12.		
	Cocks.	Hens.	Cocks.	Hens.	Cocks.	Hens.	Total.
Barnstable,	–	–	–	1	12	4	16
Berkshire,	7	3	9	–	68	35	103
Essex,	98	80	37	28	523	322	845
Hampden,	12	7	3	3	125	71	196
Middlesex,	103	52	22	17	651	403	1,054
Norfolk,	38	33	11	6	219	146	365
Worcester,	43	46	16	14	339	215	554
Totals,	301	221	98	69	1,937	1,196	3,133

Statistics on Deer shot in Season of 1916.

County.	First Day of Open Season, November 20.			Entire Open Season, November 20 to 25.		
	Bucks.	Does.	Total.	Bucks.	Does.	Total.
Barnstable,	3	3	6	28	15	43
Berkshire,	36	15	51	124	62	186
Bristol,	5	2	7	12	13	25
Dukes,	1	-	1	2	-	2
Essex,	4	5	9	11	13	24
Franklin,	32	18	50	111	71	182
Hampden,	35	14	49	107	57	164
Hampshire,	34	12	46	97	56	153
Middlesex,	7	3	10	16	8	24
Norfolk,	5	1	6	11	4	15
Plymouth,	10	6	16	47	16	63
Worcester,	28	17	45	107	63	170
Totals,	200	96	296	673	378	1,051

Summary and Comparison of Deer Statistics.

	Years.									
	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Deer seen,	1,298	2,035	1,594	2,582	1,608	1,120	872	523	664	541
Seen chased by dogs,	114	120	71	26	10	13	5	4	6	2
Seen damaging crops,	85	100	227	358	242	220	153	214	237	187
Shot illegally,	40	36	49	64	30	23	13	5	4	11
Killed by trains and trolley cars.	25	60	55	50	25	35	14	25	20	14
Dead from other causes (dogs, drowning, etc.).	47	83	82	157	77	126	109	118	76	71
Shot while damaging crops,	16	17	198	327	232	313	195	212	254	208
Total killed in open season,	-	-	-	1,281	1,270	1,231	1,596	1,312	1,105	1,051
Total wounded in open season.	-	-	-	101	56	53	34	21	14	12

Damages by Wild Deer.

Counties.	1912.	1913.	1914.	1915.	1916.
Barnstable,	$149 25	$4,587 00	$147 00	$18 00	$50 00
Berkshire,	347 00	442 50	476 50	207 00	219 00
Bristol,	770 00	297 00	173 50	213 00	202 00
Essex,	382 05	287 00	243 85	43 00	75 00
Franklin,	5,523 25	3,846 72	3,644 21	3,440 61	3,763 00
Hampden,	2,055 70	2,401 15	1,786 87	1,417 23	831 70
Hampshire,	1,720 43	1,644 58	1,126 85	750 02	918 14
Middlesex,	887 00	1,541 50	418 50	666 00	683 25
Norfolk,	294 25	184 00	126 00	93 00	176 00
Plymouth,	261 50	562 34	61 25	6 00	25 00
Worcester,	2,566 50	2,606 10	838 95	1,251 80	1,449 53
Fees to appraisers and chairmen,	725 20	1,576 90	940 00	1,027 15	1,319 70
Totals,	$15,682 13	$19,976 79	$9,983 48	$9,132 81	$9,713 12